

## NEWS IN PERSPECTIVE

## MANAGEMENT VIEW

A-POWERPLANT RADIATION, a new EEI task force report assures a questioning public (see p. 31), will for the next several decades run a poor second to "the relatively insignificant radiation coming from luminous dials and TV sets. Worldwide, expected average radiation from nuclear power operations will be far less than from natural sources, medical and dental procedures. Also, the nuclear power stations of the next several decades will produce lesser amounts of radioactive wastes than has the AEC atomic weapons production to date; moreover, the report notes such wastes can be "properly handled for a fraction (one to five percent) of the total nuclear power costs."

BETTER BRAINPOWER UTILIZATION, though nothing new, is the key to meeting the crisis of inflation and its squeeze on profits, AMA's Pres. Lawrence A. Ashley advises. "Management has been trying for years to 'use his head,' but only recently have we appreciated that research can help organize and systematize brain-power utilization . . . and that research can represent profits."

PROBLEMS OF MANAGEMENT: Are they getting as much attention in the utility industry as are the technical problems? Speakers at the EEI Industrial Relations Round Table Conference reported on that question, referring admiringly to the success story the industry can claim in technical advances. Now, they ask, can we keep pace with the growing complexity of management?

JOINT DEVELOPMENT PROPOSAL to the FPC for studying the power potential of the Kinzua dam being built near Warren, Pa., by the U. S. Army Corps of Engineers "May well be an example for future development of similar projects throughout the country," say the heads of the partici-

pating co-op and investor-owned organizations. Maxwell D. Rhodes, general mgr. of the Warren Cooperative, and Louis H. Roddis, Jr., president of Penelec, declared: "We believe that the best interests of our customers, of local communities, of the state and federal government and all taxpayers will be served by this joint development uniting investor-owned and federally-financed electric companies in a common project."

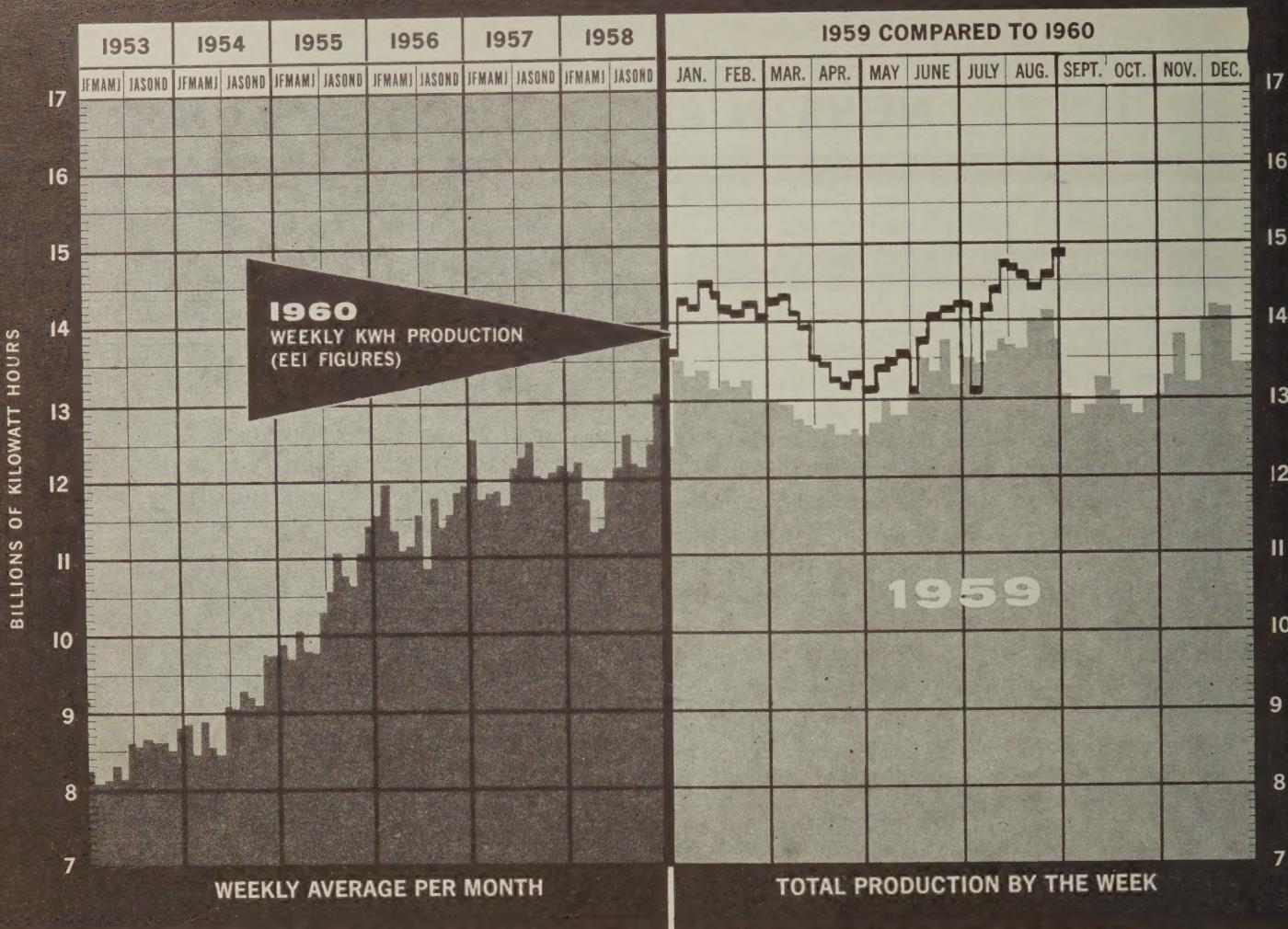
LOAD FACTOR IMPROVEMENT is management's problem—management can direct emphasis to efforts that improve load factor, which in the final analysis is the measure of efficient use of invested capital. Speaking for the recent National Electric Farm Power Conference, C. V. Sorensen asked: "What will it matter if adequate capacity, transmission and distribution facilities are available, all at reasonable or even low cost, if marketing results are such that these facilities are relatively idle a high percentage of the time?" The Indiana & Mich. Elect. Co. V-P cautioned: "The development of our market is not as simple as the mass sale of any particular appliance or piece of equipment for a specific type of use."

CONFERENCE LEADERSHIP STUDY by NICB adds to industry's hard look at what it gets from meeting, meeting, meeting. (See EL&P Oct. 15, p. 7.) Says the NICB report (Studies in Personnel Policy No. 176), many conferences fall short of goals because (a) there is no sound reason for meeting, and/or (b) there is inept handling. Yet, says NICB, the problem-solving is not only a more and more widely used management tool, it is a big personnel morale builder.

CANADIAN-U. S. SHARING of the downstream benefits resulting from joint development of the Columbia River should be "equitable," John Davis, B. C. Electric's director of research maintains.

# Electric Utility Barometer

(Source: Edison Electric Institute)



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Speaking the day before negotiators from the two countries reached agreement on a "progress report" which envisions a construction start in '61, Mr. Davis explained: "This is not the same thing as saying the whole (gross) product of cooperation should be allocated on a 50-50 basis. One country may have to put up more money than the other . . . and may have lower cost alternatives." (Estimated costs—One billion dollars in Canada, \$2-billion in the U. S.)

## ECONOMIC CLIMATE

OPTIMISTIC OUTLOOK for the U. S. economy is seen by top-level government and international officials. A big problem seen by Treasury Secretary Anderson is getting the country adjusted to a "reasonably stable dollar." The anti-inflationary climate that has been created in the past few years has put a

premium on effective and efficient management. Rising prices will not automatically help compensate for poor business judgment.

MUCH OF THE HESITANCY visible in U. S. business today can be attributed to the impact of foreign competition, notes Per Jacobsson, director of the International Monetary Fund. He says: decisions of the Treasury and Federal Reserve Board have fostered price stability, and the country is still "in the middle" of switching to business operations that are not oriented toward continuing inflation. Jacobsson thinks that "it is difficult to see any reason for an upward spurt" while this process is going on. Similarly, it is not possible to envisage a depression.

## WASHINGTON INFLUENCE

RESOURCES ADVISORY COUNCIL has been appointed by Democratic Candidate Ken-

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nedy. "Vigorous action is needed if we are to conserve, develop and assure an abundance of natural resources for America," Kennedy stated in announcing the Council. "An aggressive, affirmative policy in this field will be one of the major goals of my Administration."

GIVING FEDERAL AGENCIES "authoritarian power" over water resources has no justification, according to a new study made by the National Association of Manufacturers. The policy statement recommends each state's right to administer water resources within its boundaries; use of interstate compacts for handling regional problems; and community watershed associations as "ideal vehicles" for handling local water problems. NAM adds that "industry should be permitted maximum freedom in taking care of its water problems."

SUPREME COURT REVIEW of the PRDC decision has been asked by AEC, which contends that the opinion that set aside construction on the Lagoona Beach reactor on the grounds of safety will severely impair the development of peaceful uses of atomic energy. The Commission argues that safety findings cannot always be reached in the initial stages of construction. Moreover, AEC points out, participation by private utilities will be greatly discouraged, if not stopped altogether, if large reactors cannot be built close to urban centers. The Appellate Court's decision, says AEC, in appealing for its overturn, clouds the validity of eight other reactor projects.

TVA FUND-SEEKING will start November 15 when it will offer \$50-million in revenue bonds—the first installment of the \$750-million bond financing plan approved by Congress. Generating facilities scheduled to be in operation by 1963-64 total about 3-million kw and will cost about \$480-million. This is to be financed by retained earnings and public bond sales. Bonds are payable from net proceeds, which in fiscal 1960 came to approximately \$100-million.

REA CO-OPS' BUYING AGENT participated in a violation of the Robinson-Patman Act when it got a commission from a seller of electrical equipment, according to a U. S. Court of Appeals. The Kentucky Rural Electric Cooperative Corp., purchasing agent for 22 operating REAs, had sued Moloney Electric Co. for treble damages, alleging that when Moloney stopped paying it a commission on sales, the supplier had broken the law. Moloney said that the Act's ban on false brokerage required stopping the commissions.

SPEAK UP FOR THE BOGGS BILL is the advice given by the U. S. Chamber of Commerce. The measure, which was reported out of committee but failed to pass the Congress, would enable utilities to subtract as a business expense money spent to influence legislation. The Chamber thinks enactment is a "good possibility" . . .

### INDUSTRY SIFTINGS

RECORD TRANSMISSION PERFORMANCE at higher voltages (up to 690-kv) and over longer distances (up to 1000-miles) than any now operating anywhere in the world—have been proved feasible in the recently completed two-year study by Pacific P. & L. Co. and Westinghouse. The team used computers to determine the effectiveness of corrective devices needed to stabilize such high voltages over the length of such circuits. Observed Joseph K. Dillard of Westinghouse: "Now the utility industry can compare the economics of extra-long-distance transmission with the alternate of transporting fuel to powerplants at the load-centers of the nation and for determining the best possible sites for future large-capacity plants."

NEW FRANCHISE VICTORY in Des Moines, Iowa, resulted from one of the largest votes ever recorded in such a special election in that city. With a victory margin of nearly 11 to 1, Iowa P. & L. won brand new 25-year electric and gas franchises. For getting out the large and decisive vote, Iowa Power's Pres. A. Paul Thompson credited his company's 1,080 employes, "with the IBEW Local spearheading the rallying of labor support."

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WEATHER-CONDITIONED SUBURB, the first in the nation to be completely air-conditioned, will be developed by Levitt & Sons, Inc., on the Maryland edge of Washington, D.C. The proposed 4500-home Belair suburb is to be completely supplied by Westinghouse--with \$6-million worth of heating, air-conditioning and appliance products (20,000) the latter representing from \$1000 to \$1500 portions of the \$14,990 and up homes.

UTILITY COMPANY AWARDS--Best stockholder annual report awards in "Financial World's" 1960 competition went to two New York state utilities, Rochester Gas & Elect. Co. and N.Y. State Elect. & Gas. For best advertising of the year, recognized with "Public Utility Ad-Views" Socrates Award, the Philadelphia Elect. Co. won over runnersup Cincinnati G. & E. and Kansas City P. & L.

"MAKE YOUR HOME HAPPIER with a New Appliance," repeat campaign of the newspaper industry, is called the biggest pre-holiday appliance promotion in the nation. Utilities are reported building big efforts around the Nov. 14-26 newspaper drive.

MEDALLION HOME REQUIREMENTS used by utilities are in dire need of standardization at minimum levels, GE's George Bogard told the Electrical League's annual conference last month. He charged: "The lack of any floor under Medallion Home requirements, if continued, will soon undermine the best promotional program the industry has ever hit upon."

UTILITY PROMOTION "BULLS-EYE" should be the 13-29 age group, urges Ash Collins. In a recent Reddy Kilowatt pitch, he referred to statistics predicting a 35-percent increase in the population of this group from 1960 to 1970.

LIGHTING LEASE PLAN, announced by Westinghouse Credit Corp., is available for periods of two, three or five years. Designed for stores, offices, factories and schools, the lease can cover up to 5-percent of installation costs, as well as include option to purchase.

RECENT RATE MATTERS--Maine Supreme Court grants Central Maine Power Company amounts classified in Account 100.5 which had been previously excluded from the rate base by the Maine Public Utilities Commission. The Court also upheld company in its right to include expenditures for water rights in the rate base. The Commission was also reversed in its exclusion of three hydro stations from the rate base because of the Commission's contention that they were not "used and useful" in the public service.

In a rate proceeding of the Arizona Public Service Company, the Arizona Corporation Commission has approved (subject to a ruling by the State Supreme Court) the use of an automatic adjustment clause to take care of "any changes in the tax rate or method of computation for Federal Income Tax or State Income Tax from that used in the return filed by the Applicant for the calendar year 1958." A similar adjustment clause for labor costs was denied.

COMMUNITY PR JOB IN CLEVELAND includes some impressive spotlighting of the utility's correlative contributions. For example, Cleveland Elect. Illuminating Co. reports statistics like these: (1) having some 350 employes enrolled in its after-hours educational program, and (2) adding \$33-million to Northeast Ohio's economy each year through the purchase of materials, equipment and services.

NEMA MEETS THIS MONTH in the first annual session under reorganization adopted a year ago. Top leaders of all NEMA groups will assemble in NYC on Nov. 17 for one-day meeting. Association's divisions are holding separate conferences, with only three meeting at same time in Atlantic City.

STRIKE ACTION AT GE, you probably noted, did not involve the Schenectady union from the outset. Workers at the company's headquarters operations were reported to have defied their top leaders in remaining on the job.

BIG MERGER IN THE UK, now being explored, would create one of the world's biggest manufacturing groups, combining English Elect. Co. Ltd. and General Elect. Co., Ltd., through a holding company setup.

'Manage Technology Better . . .'

## Advise New Look At R & D Impact

Throughout industry and government emphasis on R & D has been on the upswing for some time—and now, emphasis on the "impact on management" is beginning to catch up.

Such a theme drew most of the attention of participants in the recent Eighth Annual Engineering Management Conference, jointly sponsored by nine major engineering societies of the U. S. and Canada.

Key warnings at the conference came from Bell Telephone's Estill I. Green: ". . . the survival of our society will depend upon our success in utilizing science for essential needs," and from General Electric's Vice-Pres. Clarence H. Linder: ". . . a monumental effort is needed in the area of managing the technology we are amassing . . ."

Noting that many companies are having to "take a new look" at their own situations, Mr. Linder observed that survival in industry is becoming more and more a question of how management takes a new technology and organizes it into use—"who can bring the product to the market the quickest." The big objective, he pointed out, is how to expedite the process of moving forward with innovations.

Mr. Linder called better management of the technology we have "a big challenge." He added: "As engineers, we are managing our technology very, very badly."

The GE executive decried the widespread duplication of technological development in U.S. industry. As part of the solution to this problem, Mr. Linder suggested that engineering society activities should be better coordinated (and as an example, he recognized the

significance of the joint sponsorship of this conference by the nine co-operating societies).

Mr. Linder proposed that societies face up to the fact that requiring attendance at too frequent meetings, wherein much is duplicated, is not the best answer to the problem of managing our technology. He said: Maybe we need a revolution in the present "umbrella" of society organizations—possibly a new set of categories.

And, Mr. Linder repeated his warning—"We must give more consideration to what the impact of science and technology will be."

Mr. Green, executive vice-president of the Bell Telephone Laboratories, predicted acceleration of scientific progress and reported that, for technology as a whole, the momentum is still building up, and "no saturation is yet in sight." He also noted these trends which might have import for management: (1) technology is becoming vastly more complex; (2) its cost is rising at a disturbing rate; (3) an increasing proportion of the R & D effort is being conducted at government expense, with increasing emphasis on national security; and (4) there is increasing concentration on technology designed to promote human welfare.

Stressing the fact that new technical forces and trends in R & D progress "will pose new and grave problems for industrial management, both individually and collectively, in the years ahead," Mr. Estill listed the following as "questions that naturally arise":

1. What sort of organizational structure is best adapted for technological change? How develop entrepreneurial spirit?
2. How large a research and development program should

(Continued on page 30)

**At Engineering Management Conference,**  
Speakers Green and Linder (seated) chat with  
Commonwealth Edison's Robert Gear, a luncheon toastmaster.

## Roddis: Poor Service Is Big Utility Loss

It's past time to stop debating who is responsible for repair service, or lack of it, Louis H. Roddis, Jr., president of the Pennsylvania Electric Co., has advised his associates in the Pennsylvania Electric Association.

To point up the dollar value of his premise, Mr. Roddis brought them this impressive calculation extrapolated from nearly 8000 returns in a survey of residential customers on the Penelec system—just 2.9-percent of the residential customer total who complain about appliance repairs could represent a potential loss of 91,000 potential heating customers for Pennsylvania's electric companies, and this could mean a possible annual loss in revenue of an estimated \$11-million "which these utilities might rightfully anticipate."

The Penelec president explained to the recent PEA conference that the decision to conduct the survey of his own company's residential customers arose from a personal experience with all-electric living. This produced two questions: (1) how does the average customer manage to keep his wife's push buttons func-



tional?; and (2) just how much revenue is Penelec losing through inoperative equipment?

Confirming the fact that "appliance repair service is a factor with which we must reckon," the survey indicated to Penelec that 42-percent of all its customers required appliance repair service in the past two years. Of the 7,904 customers expressing their opinion of the quality of repair service received, 29-percent rated it fair or poor. And, Mr. Roddis labeled this "a significant number who are lining up to switch to a competitive energy when they buy their next appliance."

The Penelec president developed his warning from this base:

"Sales people will back up the claim that it is very difficult to sell all-electric to a customer who has

had an unhappy experience with an electric appliance. Our 970 computer came up with the prediction that 91,000 potential heating customers—representing 10-percent of the 29-percent who complained about appliance repairs, or just 2.9-percent of total residential customers—could be lost.

"Utility presidents, including myself, are not accustomed to taking hasty action on reports that customers are losing confidence in the dependability of electric appliances. But, since all of us are interested in a dollar's worth of revenue, both actual and potential, I hope everyone will join in asking, 'What should be done about it?'"

"The utility's stake is great. It's time we take the lead in seeing that every customer is a satisfied customer."

R & D Impact—cont. from p. 29

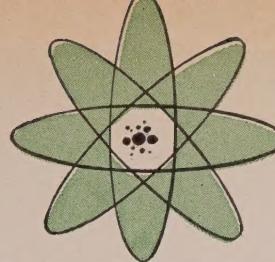
any industrial organization undertake? How much basic research content? How evaluate R and D? How finance it?

3. How should the R and D program be planned? How far ahead? How coordinate with market research?
4. How can the professional staff best be managed? How provide needed motivation and challenge? What financial incentives?
5. What qualifications and training will management people need? What understanding of science? In what circumstances will technical training be essential?
6. How can most effective use be made of data processing—for operations and for organization control and planning?
7. How can management make effective use of the new tools available for analysis and decision-making?
8. How can the plant investment involved in technological advance be financed?
9. What consideration should be given by management, individually and severally, to the social and ethical implications of changing technology (e.g. automation)?
10. How much R and D should be undertaken by industry for government—by each organization; by industry as a whole?
11. How can private and government technology be better coordinated? How can industry take better advantage of government advances in technology (e.g. in such fields as human health, plant genetics)?
12. How can private industry and government reconcile their divergent views on the patent system?
13. What can be done by private industry as a whole, in view of increasing governmental direction of technical progress, to preserve the values of free enterprise and minimize its drawbacks?
14. What should industry do to promote increased understanding of public issues involving science and technology?

## ADDENDUM—31st Major-Appliance Survey

In the original tabulation covering electric residential air conditioner sales, as listed in the Major-Appliance Survey carried in our August 1 issue, sales figures were combined to conserve space and, in so doing, resulted in some confusion. Therefore, we are listing below the utilities involved where confusion occurred and the correct information in each category:

UTILITIES	ELEC. RESID. AIR CONDITIONERS			
	TOTAL SALES IN 1959			
	Central Systems	Compressor Type	Room Units	
	By Utility	By Others	By Utility	By Others
<b>CALIFORNIA</b>				
Modesto Irrigation District	None	N.A.	None	N.A.
Pasadena Municipal Lt. & Pr. Dept.	None	N.A.	None	N.A.
Sacramento Municipal Utility Dist.	None	N.A.	None	9,687
San Diego Gas & Electric Co.	None	N.A.	None	5,100
<b>COLORADO</b>				
Public Service Co. of Colorado & Subsid.	2	N.A.	61	1,500
<b>GEORGIA</b>				
Georgia Power Co.	None	N.A.	3,785	51,215
<b>MISSISSIPPI</b>				
Mississippi Power Co.	None		120	3,000
<b>NEVADA</b>				
Sierra Pacific Power Co.	None	N.A.	None	N.A.
<b>NEW YORK</b>				
Orange & Rockland Utilities, Inc.			40	N.A.
Rochester Gas & Electric Corp.	None	N.A.	117	1,583
<b>TEXAS</b>				
City Public Service Board, San Antonio	None	N.A.	None	10,395
Texas Power & Light Co.	None	N.A.	None	N.A.
<b>WISCONSIN</b>				
Wisconsin Public Service Corp.	None	N.A.	145	N.A.
<b>CANADA</b>				
Manitoba Power Commission, The	None	N.A.	None	N.A.
<b>N.A.—Not available</b>				



**NEGATIVE PUBLIC REACTION** to atomic energy development, identified in recent opinion polls, must be met with "an organized, integrated and intensified effort to inform the average man," advises GE, noting that much of the public information on atomic energy to date "has been over the head of the average man." Encouraging statistic: 58-percent of the people questioned in the GE survey react favorably to the idea of having a nuclear power plant in their city. On the other hand, GE concluded from its survey results that "the average American is relatively uninformed and confused about the application of atomic energy for peaceful uses. (A poll by ConEdison produced similar results, showed a relatively consistent hard-core of negative attitude responses.)

**NEW AEC LICENSING RULES**, effective since mid-October, permit site preparation, procurement of components and the construction of non-nuclear facilities, before a construction permit is issued, but prohibit the laying of the foundation for or the installation of any portion of the permanent facility. Provisional licensing amendments may not exceed 18 months, but upon good cause, the license expiration date may be extended.

**RADIATION CONTROL PROGRAM** proposed by the state of Kentucky was presented formally to the AEC recently, the first "formal" transfer of Federal control offer since the Atomic Energy Act amendment passed in Sept., 1959. Upon receiving the proposal from Kentucky's Gov. Combs, the AEC undertook "an evaluation to determine if it is compatible with the Commission's program for regulation of the three types of radioactive materials covered in the amendment for regulation . . . and if it is adequate to protect public health and safety."

**TRAINING FOR STATE OFFICIALS** engaged in radioactive materials licensing and inspection functions is being provided at AEC facilities, with the first of series of 6-10 week courses now underway at the Commission's Health and Safety Laboratory in New York. Argonne National Laboratory will offer another in February, Oak Ridge National Laboratory will conduct one next April. The training program is another step in encouraging states to assume control responsibilities.

**REACTOR SAFETY COMMITTEE** formed by the Atomic Industrial Forum "to initiate one or more projects in this important area" is expected to undertake "some type of program activity which would permit increased industrial opinion, initiative and responsibility to be applied to the difficult problems of reactor safety."

**ATOMIC SCIENCE FRONTIERS** should be conquerable by the ideas and vision of our scientists and engineers, but in this area there is a lack of sufficient long-range planning. This is a conclusion drawn from hearings held earlier this year by the Joint Committee's research and development subcommittee. In a summary-analysis accompanying the recently released text of the hearings, this conclusion is emphasized:

"There is need for periodic examination of advanced, long-range technological applications arising from advances in basic science. The best people at government, university, and industrial laboratories should be encouraged to devote time to the formulation of advanced applications of nuclear energy and the selection of the most promising concepts for development. A periodic examination and review of such possibilities by both formal and informal means is desirable."

"Occasionally work in a peaceful context on a long-range application starts through general recognition of promise in a possibility; more often it starts through the long, painful, often discouraging promotional efforts of a single man or of a small dedicated group."

**A-POWER PROGRESS DELAYS** have changed the role of the IAEA, according to Director General Cole. The situation now: "The introduction of nuclear power will for quite some time be largely restricted to areas with a fairly high degree of industrialism where large power reactors can be effectively utilized . . . and some time must elapse before the less developed areas of the world can reap the full benefits of radiation application."

**IRRADIATED FUEL ELEMENTS** from heterogeneous reactors (in which the burnup is larger than 100-megawatt-days per metric ton of fuel) are the subject of non-destructive analysis in a research program being sponsored by the International Atomic Energy Agency. U. S. organizations have been invited to participate.

**LIABILITY FOR RADIATION INJURIES** resulting from reactor incidents must be governed by some uniform standards, which must be set now, according to the view of Prof. Wm. J. Pierce of the Univ. of Mich. Law School. (He reported recently to a meeting of the American Bar Association on the progress made to date in this area by a special committee of the National Conference of Commissioners on Uniform State Laws.) Meanwhile, AEC rules on radiation protection standards (10 CFR Part 20), being amended effective Jan. 1, will in effect reduce to about one-third the lifetime accumulated radiation dose for workers, as permitted in the present standard.



Photo courtesy of San Francisco Chamber of Commerce

## Golden Gateway

Beautiful, cultural, cosmopolitan San Francisco is the center of the West Coast mining area, processor of California's fabulous fruit and farm crops, and one of the nation's major distribution points and financial areas. Its importance as a western rail terminal has grown ever since the final spike was driven in the first transcontinental line, and four Class I railroads now serve the city. One of the

country's outstanding electric utilities has stimulated growth by serving expanding power needs.

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by RALPH ELLIOTT

Washington Editor

## Score One For Mr. Hamil

In his talks this fall at the ten regional meetings of the National Rural Electric Cooperative Association, REA Administrator David Hamil is demonstrating again that he has the kind of savvy called for by his particular job.

He is laying the greatest emphasis on sensible "co-op talk"—primarily the need for conforming operations to changing conditions of service, for stepping up consumer relations work, and for longer-range planning. Also he is stressing that the REA program draws its strength from bi-partisan support, and must be run on a non-partisan basis to stay strong.

But most significantly, he is continuing to avoid being baited into an open verbal slugfest with NRECA's general manager, Clyde Ellis, over political controversies which Ellis insists on dragging into co-op affairs.

No single individual has done more than Ellis to keep the REA program boiling with politics. He has managed to thrive in much of the co-op world by keeping the fires burning under various political issues, real and imaginary, as the self-styled champion of millions of farm power consumers. His performances over the years have shown that in the eyes of co-op people he is at his impressive best when employing the arts of self-defense and counter-attack. For he seems to have had little trouble in leading a majority of co-op members into believing that attacks upon him are also attacks upon the co-ops themselves.

This being an election year, Ellis' lure for battle is being colored to fit the occasion. He is saying, for example:

"Once again, we Americans prepare to elect a new Administration.

Will it be good for our program, or bad? Will it champion policies that will encourage our rural electric systems to go forward in a manner good for all Americans? Or will it echo the propaganda lines of our opponents, and be guided by a philosophy that will harass and hinder us? We don't know . . . any more than we could have known at this time in 1952."

Ellis goes on to blast the Eisenhower Administration, firing everything he can get his hands on. "As the years passed after 1952," he charges, "we were jolted time after time by the policies and actions of the new Administration." In enumerating a long list of complaints, he uses the familiar technique of tying together various developments directly related to rural electrification, and those not directly related wherein Administration action may have frustrated or slowed down the government power movement—in which Ellis plays a leading role.

Condemnation of proposals for taking the subsidy out of the REA interest rate, and for co-op consideration of the feasibility of private financing, is being interwoven with condemnation of Administration policy concerning such matters as power cost allocation at multi-purpose projects; power marketing criteria; TVA operations; "no new starts;" partnership development of resources, etc. Ellis works on the theory that if the co-ops are told often enough that the government power fight is their fight, they will eventually believe it.

In the face of this performance, it must have been a frequent temptation for a Republican REA Administrator to set the record straight with some stinging rebuttal aimed at Ellis. But that is what

Ellis would like. It would set the stage for him to go into his stellar act of the unjustly accused defending himself and his co-op members.

Instead, Hamil has simply ignored Ellis' accusations and has talked common, co-op sense to the meetings. His defense of the Administration's record has been impersonal and factual: "Since President Eisenhower took office in January 1953, REA has already approved 44.5 percent of all the loans approved during the 25-year history of the agency. More generation and transmission loans have been made during the past 7½ years (\$511-million) than were signed during the preceding 17½ years of REA (\$453-million)."

Hamil's only reference to Ellis has been incidental: "Naturally, I am concerned with the outcome of the elections. Everybody knows my politics, just as everybody knows the politics of NRECA's capable general manager, who was once a Democratic Congressman from the State of Arkansas."

The Administrator is stressing that "No one person, no one party, no one administration can take credit for the achievements of rural electrification." In pointing out that co-op managers and directors are mainly responsible for the continued support of the program, he is telling them: "Our program is not masterminded in Washington. Perhaps that is why it has proved so successful." And he adds the warning that "No matter how good your management, you cannot have a good cooperative unless it is run by co-op principles."

Hamil's conduct at this year's regional meetings was disappointing to Ellis. But the effectiveness of its restraint was the highlight of the entire series.

by A. C. FARMER  
Economic Consultant

## Prosperity in the Post-Election Years

Five years of business prosperity lie ahead for America regardless of which political party is successful in the elections on November 8.

Regardless of party label, a growing and expanding America will be inherited by the next Administration and the next Congress. There is this qualification—ultimately the future will be shaped and the prosperity affected by the monetary policies that are adopted for the people of America by the party that is successful at the polls.

To elaborate:

- National prosperity is sustained by national business activity, and business activity is measured by the exchange of goods and services for money.
- The money available for exchange consists of (1) earned income of individuals and corporations plus (2) credit income, or the amount that is borrowed against future earnings.
- Credit income shows up in the form of bank loans and in the form of net private debt.
- The use of credit income for providing additional purchasing power can safely be employed until the volume of debt increases to the point that no longer can it be supported by the volume of money in the economy. A measurement of the safety element is provided by comparing the total net private debt with the total volume of money in the economy, or by comparing the bank loans at the commercial banks with the total demand deposits.

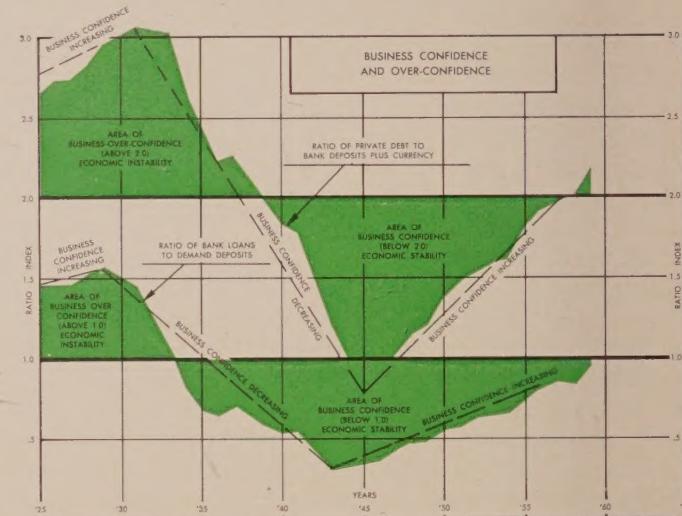
The chart illustrates a situation in the past where the net private debt became too large in relation to the volume of money, and where bank loans at commercial banks became too large in relation to demand deposits.

The figures for the past five years are as follows:

Year	A	B	Ratio	C	D	Ratio
	Bank Loans	Demand Deposits	A/B	Net Private Debt	Bank Deposits Plus Currency	C/D
Dollars in Billions						
1955	82.6	109.9	0.75	402.5	220.6	1.83
1956	90.3	111.4	0.81	439.4	226.0	1.94
1957	93.9	110.2	0.85	468.2	231.9	2.02
1958	98.2	115.5	0.93	496.1	247.1	2.00
1959	110.8	115.4	0.96	547.5	251.9	2.24

This situation occurred at the end of the twenties when the net private debt was greater than three

NOTE—Earned income is meant to include wages—salaries—interest and dividends—everything except borrowed money.



times the volume of money and the bank loans at the commercial banks were more than 50 percent larger than the demand deposits. An economic collapse occurred as a result in the early thirties. Based on this empirical data, it can be concluded that economic instability again will develop if these relationships again are established.

If the net private debt continues to expand at its present rate of about 10 percent per year, it is clear that a dangerous situation will develop in about five years, and the same statement applies to the continued increase in bank loans, which also are expanding at about 10 percent per year.

Regardless of which party is successful next November, it is unlikely that any attempts to slow up the use of credit spending will be successful. The reason is that if the economy is forced to depend entirely on earned income without the use of credit income, it would lead quickly to a serious business recession, and no Administration dare take the responsibility of shutting off the use of credit income if a business recession is the immediate result.

It appears a certainty that the economy of America will be supported in the future both by earned income and credit income.

From this it is therefore possible to reach two conclusions:

First, that the American economy will continue to enjoy prosperous conditions at least for the next five years.

Second, that from the accumulation of private debt and the expansion of bank loans, a critical point in the American economy will be reached soon after 1965.

# 'House of Ideas' Shows Best and Latest in Electrical Living

The ultimate in convenient electrical living is on working display in a complete "House of Ideas" at Central Illinois Light Company's general office in downtown Peoria, Ill. Customers who come in to pay their bills, contractors, and civic groups on tours are exposed to the best and latest ideas in modern living. Some 10,000 visitors have been through the House of Ideas since it was opened in September 1959. Brightly colored invitations, guest tickets, and information folders along with newspaper and radio advertising attract the visitors and serve afterward as a reminder of what they have experienced.

How electric light becomes the tool of the decorator to give the home greater expanse and increased beauty is revealed in the living room, dining room, patio and front porch. Carefully selected furnishings are illuminated to their best advantage. The kitchen is a showplace of appliances arranged at convenient working levels, combining functional, aesthetic and comfort appeals.

The "path of light" system enables a visitor to pass throughout the home, in safety and convenience, turning on lights ahead and turning them off behind him. Wall switches are decorative touch plates matched to the wall paint or paper.

The living room features valance and cover lighting, plus an ensemble of portable lamps that provide proper reading light at chairs and sofa. In place of yesterday's wall receptacles is modern multi-outlet plugmold, one pair live and one pair controlled by wall switch.

The dining room ceiling light is not only a pull-down, but also travels laterally on its own track for positioning directly over the center of the table. A home study area exhibits the best type of lighting for shadowless paper work.

The kitchen displays a built-in wall oven, large refrigerator-freezer, automatic washer, dryer and dishwasher, counter-top range with thermostatically controlled top burner, and a hidden exhaust fan. Newer in concept are the hot food server, built-in counter-top mixer, and the

appliance control center with timer clock and protective circuit breakers on each outlet. A comfortable diffused light falls on every working area.

Many familiar problems in lighting are solved in the 'House of Ideas.' Guests are invited to try the dimmer switch, turning the light down softer to any degree desired. An illuminated ceiling brings daylight indoors with instant-starting fluorescent light. A bathroom vanity is lighted from three sides for make-up and shaving. A closet light turns on as the door is opened. Indirect lighting is hidden under wall cabinets and behind soffits.

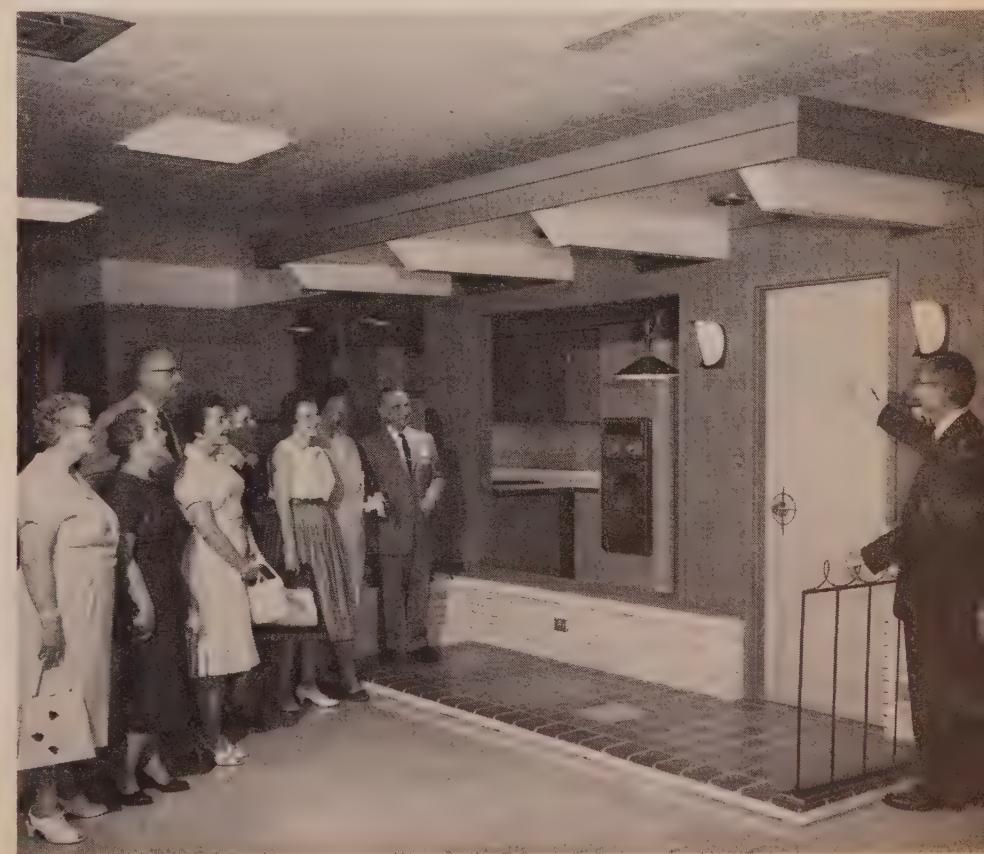
Electricity also moves outdoors to the patio area where visitors see a modern electric yard or driveway light that goes on at dusk and off at dawn, controlled by a photoelectric cell. To serve power mowers and yard tools, barbecue rotisserie or portable lights, weatherproof electrical outlets are provided.

The front porch displays two types of modern porch lighting to dramatize the entrance and offer a considerate welcome for after-dark visitors. Two more thoughtful touches are illuminated house numerals and a door chime button that softly glows. The patio display includes an appealing feature for winter—an electric heating cable that can be installed in porches, steps, walks, and drives to melt off ice and snow.

Three major advertising campaigns are planned for the months of February, May and September when changes will be made in the furnishings and decor of the 'House of Ideas.' Invitations by newspaper, radio announcements and direct mail to clubs and organizations are to be stepped up during these periods. All correspondence from CILCO's Home Service Department bears a 'House of Ideas' symbol on the letterhead.

Central Illinois Light Co. believes this 'House of Ideas' will prove itself an effective sales tool in promoting better lighting, adequate wiring, kitchen planning, and modern appliances.

Modern porch lighting dramatizes the entrance to Central Light Company's "House of Ideas," offers after-dark visitors a considerate welcome. The "House" is located in the Peoria utility's new general office building. Thousands of visitors have visited the display in its first year.





# MONTREAL'S APPROACH TO SPACE-HEATING RATES

Development of a general-purpose rate for domestic customers in Montreal who heat their homes either solely or principally by electricity followed discovery of 3500 such customers on system despite zero promotion.

By J. C. ANTLIFF, Manager, Statistical and Rate Research Department, Quebec Hydro-Electric Commission

OUR OFFICIAL POSITION is that we do NOT actively promote domestic space-heating load.

However, we have taken steps to regularize a bad situation which existed up until a year ago whereby 92% of the customers making use of electricity as the sole or chief means of heating were paying for said heating service on the last step of the regular domestic rate schedule, i.e. 0.8¢ per kwh. In contrast, the other 8% of space-heating customers (those whose total demand exceeded 7.5 kw) were placed on a commercial rate. The return per kwh from such customers was approximately double the return from the first group but the basic load characteristics of the two groups showed very little difference.

All space-heating customers are now treated on the same basis. They pay throughout the year for all energy at the regular domestic block rate. However, for a specified 6-month Winter period only, these customers pay an extra charge of \$2.00 per kw per month on 60% of the established total demand in each billing period falling in the 6-month heating season.

The annual return from such customers who exercise some measure of peak control is usually in the range of from 1.3 to 1.4¢ per kwh. If the customer is small and if he has no means of peak control, the annual return is usually in the range from 1.5 to 1.6¢ per kwh.

Special note needs to be made of the unique situation in Montreal arising out of the fact that over 90% of the space-heating customers live in very small apartments, usually of 1 to 2½ rooms. This tends to raise substantially the average return per kwh received from all space-heating customers.

Another important consideration is that our sole source of energy is hydro-electric generating stations.

## Survey Revealed Problem

A survey made early in 1959 revealed the fact that 3500 domestic customers were using electricity either solely or as the principal means of providing for space-heating needs. It was also shown that 3300 of these customers had been permitted to remain on our ordinary domestic block rate while 200 were treated as though they were commercial customers and were billed accordingly using a demand type of rate.

The group revenue returns per kwh for all purpose usage, including space heating were 0.91¢ and 1.86¢ respectively.

(Continued on page 69)

## THE NEW RATE STRUCTURE

The Quebec Hydro-Electric Commission's general-purpose rate for domestic customers in the Montreal metropolitan area who space-heat their homes either solely or principally by electricity was set up as follows, effective with the start of 1959-60 heating season:

Energy:	0 to 15 kwh/mo	60¢
	16 to 60	2¢ per kwh
	61 to 200	1.3¢ per kwh
	201 and over	0.8¢ per kwh

Demand: During the 6-month Winter season ending with the regular meter reading taken in May, there is a demand charge on 60% of the registered demand of \$2.00 per kw per month. Meter readings are taken monthly and meters are reset to zero demand at the time of each reading falling in the Winter season.

There is no charge for demand in the 6-month Summer period. The rate for energy is identical with the rate charged non-space-heating customers throughout the year.

# EBASCO'S SEMINAR IN PUBLIC UTILITY SAFETY

**Two-week safety seminar conducted annually not only inculcates safety in the thinking and actions of supervisors and executives; it also teaches leadership fundamentals.**

By W. T. ROGERS, Director of Safety Services, Management Consulting Division, Ebasco Services, Incorporated

FINDING QUALIFIED MEN to head up safety programs was a big problem for utility companies back in 1949. They were trying to solve the problem by hiring safety directors from war industries or by handing the safety jobs to one of their own engineers or superintendents. The result on the one hand was a basic need to indoctrinate safety men from outside the industry in the problems of the public utility industry, and on the other, a need to train the utility-experienced men in safety work and programming.

Ebasco set about to devise a program to effectively train and indoctrinate both groups. It was readily agreed that the safety man should have a thorough understanding of: (1) the importance of safety in a public utility; (2) the responsibility of safety on the part of various echelons of management and the employee; (3) the methods to be used in setting up and carrying on an effective safety program, as well as instruction in the actual techniques of safety engineering. In addition, the safety man should have some experience in public speaking, conducting meetings and "selling" safety to those above him in the organization as well as those on his level and the working forces. He also should possess some practical, psychological "know-how" and

have the fundamentals of leadership.

In mapping out such a program, the time element had to be considered. Most men could not be absent from their regular jobs more than two weeks, so the course was patterned to this schedule.

For the "academic" side of the proposed program, Ebasco looked toward New York University and its Center for Safety Education for assistance. The university had the staff, facilities and experience for such an undertaking. Ebasco and university officials met and details of the seminar were worked out.

The general outline of the seminar provides for classroom instruc-

tion by University faculty members each morning from 9 to 12. Several afternoons are devoted to field trips to neighboring utilities and other installations where actual safety programs are studied. Other afternoons are given over to demonstrations and lectures on safety and fire protection by members of the Ebasco Safety Staff. There is ample opportunity during the course for roundtable discussion of safety problems.

The seminar was not long in operation before it was found to be an ideal training ground for engineers, superintendents, managers and other operating people not only in safety principles and practices

Seminar personnel look on as trainees at Con Ed's safety school in Astoria are instructed in the use of extinguishment equipment on gasoline fires.



but in supervisory and management techniques. As a result, the course has developed so that the recently completed 13th Seminar was comprised principally of operating personnel. Companies have found it to have a definite place in their overall management development program and indeed the seminar can boast of several managers, vice-presidents and presidents among its alumni. A number of companies now send two to three of their people each year to get the benefit of this training.

#### Benefits Are Manifold

And just what has the benefit of this training been?

First it impresses those who take the course with the importance of safety—that it is something that can't be taken for granted—and that to obtain results in safety, it must be worked at. The importance of safety is stressed not only from the humane standpoint of saving human life and preventing human suffering but from the standpoint of efficient and economic operation. The benefits of a well-organized safety program are demonstrated as it applies to:

1. Engineering and design
2. Construction
3. Improved work methods
4. Protection of life and property
5. Reduction in insurance and medical costs
6. Reduction in claims and suits
7. Reduced public liability
8. Better employee relations
9. Better public and community relations
10. Management development

In addition to lectures and demonstrations on speaking, supervisory practices and practical psychology, the safety training includes lectures and discussions on setting up and conducting a safety program, industrial accident-prevention techniques, fire prevention and protection, automobile safety, off-the-job safety, construction safety and relations with contractors.

Safety and personnel people attending the seminar have benefitted in a number of ways. They have gained a broader indoctrination in and appreciation of the scope and importance of safety activities and their effect on the economy and efficiency of company operations.

They have learned specific techniques and methods which have assisted them in their day-to-day work—procedures such as job breakdowns, hazard analysis, observation plans, and how and what records should be kept for greatest use and maximum effectiveness in accident prevention.

These people have learned the importance of employee selection procedures in hiring safe workers and how to train men more effectively. They have received basic instruction in the elements of employee psychology, so that they better understand the attitudes and reactions of employees and how to motivate them successfully for greater safety. They have received practice in expressing themselves more clearly, so as to gain the understanding, cooperation and participation of employees in the safety program. Lastly, they have learned to interpret and evaluate their safety activities from a management standpoint—to design plans and programs which will agree with and further this standpoint and to express the objectives of these programs in terms their management will understand and approve.

#### Safety Their Responsibility

Operating people participating in the course benefit from all this training, but perhaps the greatest value of the course to them is in teaching them to accept the responsibility for accident prevention. Although ostensibly interested in safety, these people often feel it is an added responsibility which has been handed them. Without exception, however, the operating people attending the seminar have been quick to realize the responsibility for safety is theirs, for the course has shown them how inseparably accident prevention is tied to the economy and efficiency of operations—areas of responsibility they have always accepted as supervisors and members of management.

In addition to this basic acceptance of responsibility, the operating people have learned both general and specific approaches to the solution of safety problems, how and where to anticipate hazards and the means of their control, how to deal with "problem" individuals, how to communicate their instructions effec-

tively, the psychology of group leadership, and many other subjects of continuing value to them in their work.

Management trainees have also learned a great deal from the seminar. Since the average engineering curriculum devotes little time to accident-prevention theory, engineers who have demonstrated their other abilities well enough to be selected as management material often have little concept of safety and its important role in company operations. By providing an over-all picture of the scope and integration of safety in company activities, the seminar supplies this missing background, so that the potential value of the trainees to their company has been greatly enhanced. Hand-in-hand with this, the safety indoctrination of these trainees insures that accident prevention will be given proper emphasis as these men progress in their companies.

#### Safety Records Have Improved

We have been asked quite often "what have been the results of this seminar—have the companies who have had men attend improved their safety record?" In all cases we can say yes, but whether these records have improved as a result of the seminar or would have improved by other means, since there has been a general improvement in the accident experience of utility companies in the past decade—it is of course difficult to say. We can however report definite indications of the seminar's value with respect to individuals and certain company situations. For example, a safety director of a large eastern utility wrote us recently, "We have three times taken advantage of this and each time become more convinced of its tremendous value. Each of us who have attended have received many ideas and much help in our professional lives."

Another man who had a responsible position in operations in a multi-company setup was quite disturbed when he was made general safety manager for the service company—he had the uneasy feeling that he was being "shelved." Fortunately, he attended the seminar before he actually took over in his new assignment and was able to save considerable time in learning the ins and

On the field trip to Governor's Island in New York Bay, members of Ebasco-NYU safety seminar study the 1st Army's program for testing and training drivers, as well as the organization and operation of the Army's over-all safety program.



outs of his new job. More important, he obtained an entirely new concept of the safety job and was able to recognize its importance and realize that he had indeed been promoted. He credits this seminar for his changed outlook and he now views his job as one of extreme importance and opportunity for service.

One interesting case occurred several years ago when the president of a utility "sent" his top superintendent to take the course. This gentleman, not what one might call the "retiring" type, lost no time in telling us as well as the professors that he thought this was all a lot of "nonsense." However, having been instructed to attend, he dutifully completed the course. To make a long story short—the following year he came back and brought three of his men with him. He led them into the opening session and said, "Here, show these guys what you showed me."

Last year we had the president of a company attend the seminar—he had previously sent some of his men—but he wanted to find out more about safety himself and also to judge first-hand the value of the course as training for his top men. Completely satisfied, he has embarked on a program which includes this seminar as a regular part of his company's management development program.

One division manager who attended the seminar later became general manager of his company and largely credits the seminar with his advancement. Before attending the seminar he had a very narrow view of his work, his duties

and responsibilities, he said, but the course opened up a whole new outlook and concept, enabling him to progress in his company with a broader understanding of management aims and practices.

Another man, an engineer from a large South American utility, took the course several years ago. Two years ago he returned to this country as general manager to accept a gold plaque for outstanding achievement in accident prevention, on behalf of his company. He said the company had made a complete turn-about insofar as its safety record was concerned—from being one of the poorest to one of the best in the industry. Since attending the seminar he had not only taken a deeper interest in safety but had transmitted this feeling to his company and personally provided the leadership to obtain the fine safety record it now has.

#### Operating Personnel Benefit

There are at present four companies which regularly send two or three operating personnel each year to the seminar—engineers, superintendents, division managers—people of this category. These companies say that the course has not only been beneficial to their safety programs but that their men have benefited individually from the supervisory and management training they have received. One company has a central safety committee composed of operating executives and sends two of them to the seminar each year.

On the foreign scene, there is a continuing, enthusiastic response to

the concept of safety training.

Yen-Ti-Lu, head of planning for Taiwan Power Company, who attended a recent seminar wrote us: "After I came back to my country, I made a speech about the subject 'Electrical Safety' for the Sino-American Technical Corporation Association and the Taiwan Power Company, and I am going to go around our whole island (Formosa) to lecture about Safety."

From Greece comes word from A. T. Monferratos of the Greek Public Power Corporation, who recently attended a seminar, that not only has a safety program been established within the company, but that he is engaged in setting up a safety council for Greek industry.

What was started as an indoctrination course for safety directors has now become an orientation course for other staff and line operating executives. This is important, since safety is a "whole company" responsibility, a responsibility of management, supervision and employees, and no longer the sole responsibility of the safety department. Safety is everybody's job and transcends all departments and operations.

The seminar approach has been helpful to staff executives such as personnel and industrial relations people who very often have responsibility for the safety department, as well as to the operating executives who are responsible for the safety of the men and protection of property under their jurisdiction. But as a secondary result, the seminar has proved beneficial in the area of supervisory and management techniques and practices.

## Condensate Scavenging At Huntington Beach

Southern California Edison is employing a condensate scavenging system to obtain ultra-pure water for its boilers. The system will be installed at Huntington Beach Station where most phases of operation from startup to shutdown, including some of the basic functions of the water treatment plant, will be controlled automatically by an electronic computer.

Once-through, oil and gas fired boilers will supply steam to the 210-mw units. Each unit will operate at 2400 psig and 1050/1000F. Graver Water Conditioning Co. division of Union Tank Car Co., will furnish the condensate treatment equipment, with Graver Automatic Tape Analyzers, for units 3 and 4. The equipment will include three cellulose-precoated Graver-Davis leaf-type filters especially designed for condensate scavenging operations, three externally regenerated mixed-bed demineralizers, and all accessories.

The condensate scavenging system will be used to "polish" a mixture of condensate and heater drains to provide the extremely high degree of purity necessary for the boilers. It is designed for a maximum flow of 2900 gpm condensate.

## Tank-Gaging Problem Liquids

A technique for tank gaging of problem liquids has been announced by Exactel Instrument Co. Chemicals, high temperature liquids, liquids stored under pressure and volatile liquids have been highly satisfactorily gaged by Exactel mercurial Servomanometers operating on the purge bubbler principle.

Here's how it works: The pressure at the exhaust of the bubbler line at the tank bottom equals the head pressure of the liquid measured, thence is converted to inches of mercury with readout in appropriate direct units such as barrels, cubic ft, etc. The only material in contact with the material measured is a tube extending to the bottom of the tank and the bubbling gas, generally dry nitrogen.

According to the manufacturer, a fundamental advantage of the technique is that it is basically a weighing process, sensing the pressure at the bottom of the vessel, hence is not subject to error caused by temperature variations in the measured media. Initial installations have been operating on 24-hour per day service for periods slightly in excess of one year with zero maintenance.

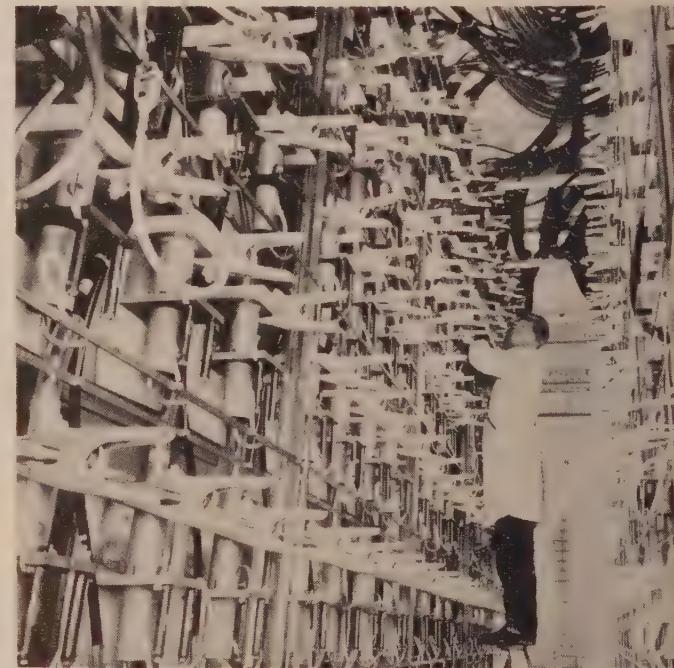
## Flexible Hose Carries Raspy Fly Ash

Ohio Edison substituted a new type of ash disposal hose for cast iron piping recently at its Niles, Ohio power plant. The tube in the new disposal hose is specially compounded to resist abrasion. Materials used in the body of the hose are wire and duck and the outer protective coating is made of neoprene.

The flexible hose was used because under certain types of firing, and with certain types of coal, an ash is produced with extraordinary abrasiveness. This highly abrasive ash quickly erodes steel and iron, and frequent replacement of disposal pipe has been a costly item.

The 10-in. hose is mounted on a trestle and flows bottom ash 1800 ft to an ash pond. The ash then settles to the bottom of the pond as the transporting water seeps away into the surrounding earth.

## Fusion Research Continues



This battery of clamps ties together a bank of 300 condensers in a joint fusion research program by General Dynamics Corp's. General Atomic Div. and Texas Atomic Energy Research Foundation. Combined discharge of several condenser banks will yield 100 billion watts for 10 microseconds. Section shown will deliver 25,000 mw for about 40 microseconds. Adjustment or complete replacement of individual condensers is facilitated by the unusual use of Lincoln Electric GC-500 welding ground clamps. The clamps provide a positive low resistance electrical path between the condensers when they are not in use. Creating the sandwich type joint between the clamp jaws by inserting polyethylene between the inner and outer sections handled the insulating problem.



# HOW CON ED CUTS FAULT-LOCATING COSTS 50%

New instrument using radar principles cuts time and cost of locating faults. Typical test time reduced to 15 min from 6 hr.

By F. J. FIGIEL,  
Assistant Superintendent  
Field Operation Division  
Substation Maintenance Bureau  
Con Edison

Connections between equipment and cable to be tested are made with 25-ft, 50-ohm coaxial cable with clips. Although Con Edison now only uses instrument on underground d-c systems, it can also be used on overhead open lines and on a-c.

Telemetroscope installed in Con Edison service truck. Using radar principles of operation, it is easily operated by one man. Within few moments after connecting on a cable, it allows operators to "see" condition of cable and localize fault to within feet.

CON EDISON has found a new way to decrease the cost and time required to locate faults on their complex network of feeder cables under city streets. An electronic instrument called the Telemetroscope\*, which operates on radar principles, has been used for more than a year for measuring distances to faults.

An over-all average savings in the cost of fault locating on a portion of our underground cables is conservatively estimated at 50%. And the equipment has paid for itself in 3-4 months on d-c use alone.

## Quick Results

One of the outstanding advantages is the ease of connections and quick

results in determining the location of faults. Many faults were located by inspections of a manhole which was determined through a measurement by the Telemetroscope. At several of these locations, other cables were found burned by communication and obviously would have developed to additional simultaneous feeder outage through the use of apparatus normally used for fault locating.

Another great advantage is the simplicity of measuring to an open conductor on a network distribution feeder, which eliminates the need for cutting or isolating the affected portion of the feeder or disconnecting of transformers as normally necessary for ratio capacitance tests.

This new instrument will undoubtedly supplant the power bridge loop test and the ratio capacitance

(Continued on page 70)



\*The Telemetroscope is made by Cornell-Dubilier Electronics Division of Federal Pacific Electric Co.

# THE CASE FOR RESIDENTIAL UNDERGROUND

**I**Open-wire overhead distribution is the most economical to install, but is it also more economical to operate and maintain than a residential underground system?

By V. K. SMITH, *Distribution Planning Engineer*  
*Mississippi Power & Light Company*

**A**LL NEW DEVELOPMENTS must be justified as to their economics, feasibility and acceptability. A few years ago, residential underground systems—though feasible from an engineering point of view, and acceptable from the customer's point of view—were not economical from the utilities' viewpoint based on the load density at that time. Our load densities are

Editor's note—this article is adapted from a paper presented by the author at a recent Southeastern Electric Exchange Engineering and Operation Section Conference.

increasing very fast now and will continue to do so if our past trends are any guide.

We have made many cost studies comparing residential overhead systems with underground systems, installed on rear property lines. Each study was carried out under a different set of conditions to determine the difference in investment costs. In each case studied, we assumed that overhead services would be paid for by the company and underground services by the

customer. One of the many types of subdivisions used in the study is shown in Fig. 1. This particular subdivision has ten lots per block with lots arranged back-to-back.

To make these studies we have considered all types and configurations of residential subdivisions. Included were lots back-to-back and lots not back-to-back. Lot widths varied from 60 feet to 125 feet, and load densities varied from 5 kva non-coincident per lot to 16 kva per lot.

Fig. 1—One of the many types of residential subdivisions on which comparative cost studies were made.

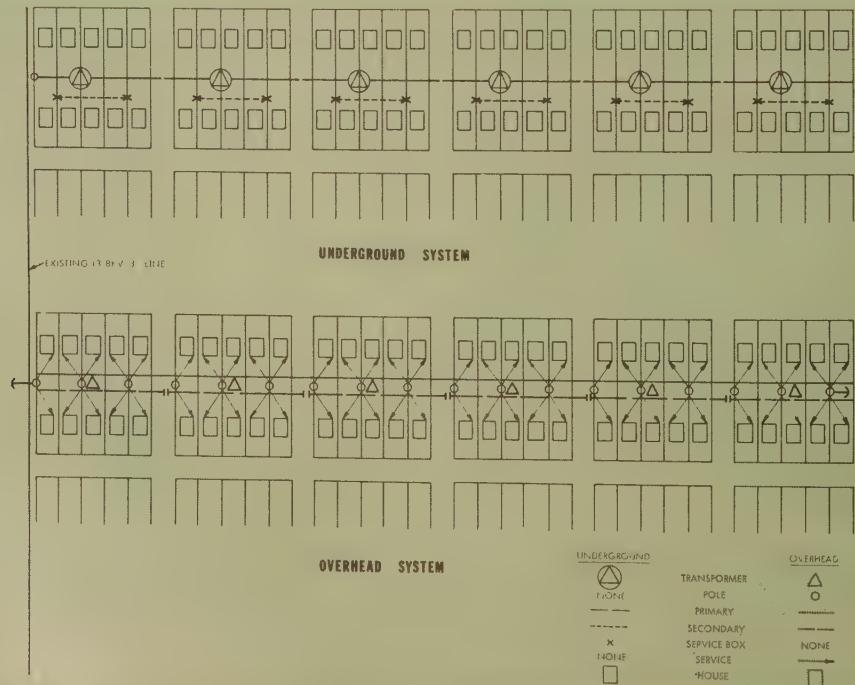




Fig. 2—Group of 132 residential apartments in Jackson, Miss., for which underground service is provided.

The minimum overhead distribution system we would install in one of our new residential subdivisions is for a non-coincident demand of 5 kva per lot, whereas the minimum underground system we would install is for a non-coincident demand of 10 kva per lot. The main reason for differences in minimum design is the fact that an overhead system can be expanded more economically than underground.

As shown in Table I, our studies reveal that it costs \$52 more for a minimum underground system than for the minimum overhead system on lots that are arranged back-to-back. These lots vary from 60 feet to 125 feet in width. On lots where less than 10% are back-to-back the difference in cost is approximately \$50 where the lot widths are 60' to 80' and \$75 where the lot widths are from 90' to 125'. We feel that 90% of all lots in residential subdivisions lie within the range of 60' to 125' in width.

#### Two Installations Now In

We made two experimental residential underground installations in Jackson, Mississippi, during 1959. A third one now awaits only the construction of homes by the tract developer. The first installation was made in Audubon Park Subdivision in Northeast Jackson using precast cylindrical concrete vaults with meters mounted on the side of the vault. These vaults were semi-buried, and we used CSP transformers and sectionalizing potheads mounted in each precast cylinder to provide sectionalizing. Direct-burial, 15-kv shielded cable was

used on this installation and buried to a depth of 42 inches.

The second installation was quite different from the first. This installation called for underground service to 132 residential apartments in a group of buildings on the Mississippi Medical School campus located along Lakeland Drive in our capital city. Since a No. 4/0 copper, 15-kv feeder existed along Lakeland Drive, we mounted conventional transformer banks along the feeder and installed a secondary underground system to each building. We worked out a joint-use agreement with the Telephone Company whereby we installed our secondary in the same trench with the telephone cable on a share-the-

cost basis for the trenching. Each apartment was well-lighted and equipped with an electric range and refrigerator. An aerial view of these apartments is shown in Fig. 2.

The third underground system, yet to be installed, will be in the Hamilton Estates Subdivision. It will consist of 47 lots with an additional 50 lots adjacent to and just west of the existing subdivision. Fig. 3 shows the plan of the underground system to be installed. The primary is to be fed from an existing overhead system on Livingston Road. Phase A of the primary is to be a complete outer loop and opened near the center at one of the new pad-mounted transformers to be used in this installation. Phase B of the primary is to be carried down the center of the subdivision in order that we might serve a 25-hp, 3-phase water well. The well will be located at about midpoint of the outer loop of Primary A. By a special switching arrangement the 25-hp motor can be served from two single-phase lines that will meet at that point.

We shall use pad-mounted transformers on this installation because we feel they have the following advantages over other types:

- (a) Lower installed cost
- (b) Three sides of transformer tank exposed to atmosphere so it can be operated at full rated loads without over-

TABLE I

#### Cost Per Customer Overhead versus Underground Single-Phase Residential Service

Lots Back-to-Back System	Non-Coincident Demand	Lot Width in Feet			
		60	80	100	125
Overhead	5 kva	88	102	117	135
Underground	10 kva	140	154	169	187
Difference		52	52	52	52
Overhead	10 kva	130	148	162	192
Underground	10 kva	140	154	169	187
Difference		10	6	7	—5
<i>Lots not Back-to-Back (Periphery)</i>					
Overhead	5 kva	132	147	173	210
Underground	10 kva	179	207	246	285
Difference		47	60	73	75
Overhead	10 kva	177	195	226	271
Underground	10 kva	179	207	246	285
Difference		2	12	20	14

**The Mississippi Power & Light Company's Basic Assumptions in Designing Residential Underground Systems (Single-Phase)**

- (1) Loop primary layout for feeder arrangement.
- (a) Sectionalizing provided at each vault.
- (2) Overhead feeders supplying residential underground shall be of the latest design, shielded and all loads or tap lines shall be properly fused.
- (3) Location of underground primary and vaults should be on rear property lines to avoid conflicts with sewer lines, water lines, gas lines, etc. This will also hold to a minimum construction under pavement.
- (4) Primary cable will be suitable for direct burial and use on 13.8-kv system with solidly-grounded neutral.
- (5) Potheads shall be used at take-off of underground dips from overhead circuits.
- (6) All direct-burial cable shall be protected by a concentric neutral equivalent in conductivity to 70% of phase wire.
- (7) All primary cable shall be shielded.
- (8) Vaults or enclosures will be of suitable size and design to accommodate a transformer large enough to serve eight total-electric homes. (100 kva CSP transformer less arrester.)
- (9) Vaults or enclosures will provide necessary ventilation and drainage if mounted at or below ground level.
- (10) Vaults or enclosures will provide space for sectionalizing switches.
- (11) Vaults or enclosures constructed above ground line and of weatherproof design shall be large enough to accommodate a 100-kva transformer and the necessary switches and secondary bus.
- (12) All vaults or enclosures shall be locked or designed to prevent unauthorized persons (the public) from entering.
- (13) All vaults or enclosures shall provide a minimum of four openings for running services direct from vault.
- (14) Services including meter loop will be installed by the customer from vault to residence.
- (15) Company will connect customers services to secondary in the vault, or service hole.
- (16) Residential subdivisions located closer than one mile to the 115-kv substation and served with an underground system will require a reactor installation in the overhead feeder to hold the fault current below 5000 amps.

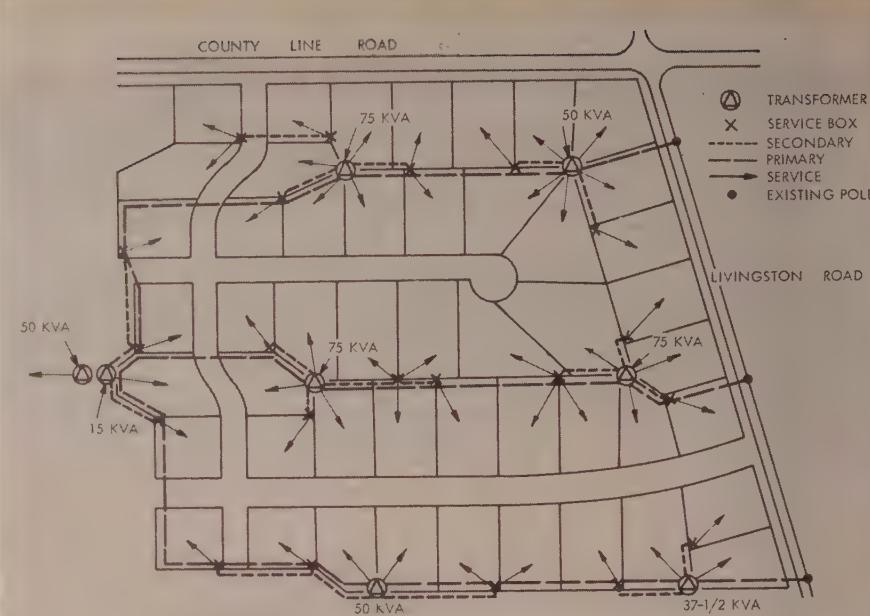


Fig. 3—Plan of underground system for Hamilton Estates Subdivision.

heating

- (c) Separation between high-voltage and low-voltage bus
- (d) Ample room for pot-heads and arresters
- (e) Sectionalizing under oil or by open-blade disconnects
- (f) Safe to install additional secondary on the low-voltage bus
- (g) No water-drainage problem
- (h) Less cost to maintain

We shall use a 15-kv direct-burial cable for the Hamilton Estates Subdivision installation. The conductor will be No. 4 stranded copper with  $1\frac{1}{8}$ " of butyl rubber insulation, semi-conducting tape, semi-conducting bedding, neoprene jacket and a concentric conductor consisting of strands of No. 14 copper. The outer jacket provides protection against mechanical damage or pos-

sible corrosion in direct-burial applications.

Manufacturers of this type cable will furnish the cable without the outer jacket at a much lower price. If there are no corrosive influences, and extra care is taken in the installation of the cable using correct backfilling procedures, this saving is well worth the trouble and investigation necessary. One utility which has used this cable without the jacket has had very good operating experience with it.

We are using a precast concrete service terminal box (cost approximately \$5.00) that is mounted just below grade for terminating customers' service.

#### Joint Use Of Easements

On buried distribution plant in residential subdivisions we have



Fig. 5—Machine used to dig trenches for residential underground system.

reached tentative agreement on general rules covering joint use of right-of-way easements. (See Fig. 4.)

- (1) The Power Company shall use the north or east half of easements; the Telephone Company shall use the south or west half of easements. This is true except where the easement is at the perimeter of the subdivision. Then the Power Company shall use the outer or lot line half of the easement and the Telephone Company shall use the inner half of the easement (closest to house). Variations from these general locations shall be mutually agreed upon.
- (2) Each company shall place its plant in the center of its half of the easement except where deviations are necessary to avoid obstacles. Where obstacles are encountered, a minimum of 12 inches lateral separation shall always be maintained, in which case positioning in the easement shall be mutually agreed upon. This assumed perimeter easements shall be ten feet in width.
- (3) The power service route shall generally be directly from the transformer or from a secondary distribution cable at the lot line nearest the transformer. The Telephone Company service wire routes will be at right angles to distribution-cable path except that deviations are recommended at points close to buildings to avoid crossing power service.
- (4) All vertical measurements for trench depths shall be from subgrade (prior to addition of top soil).
  - (a) The power service wires shall be placed at not less than 36 inches depth within easements and not less than 30 inches depth outside of easements where they are subject to being crossed by Telephone Company service wires.
  - (b) The Telephone Company service wires shall be at

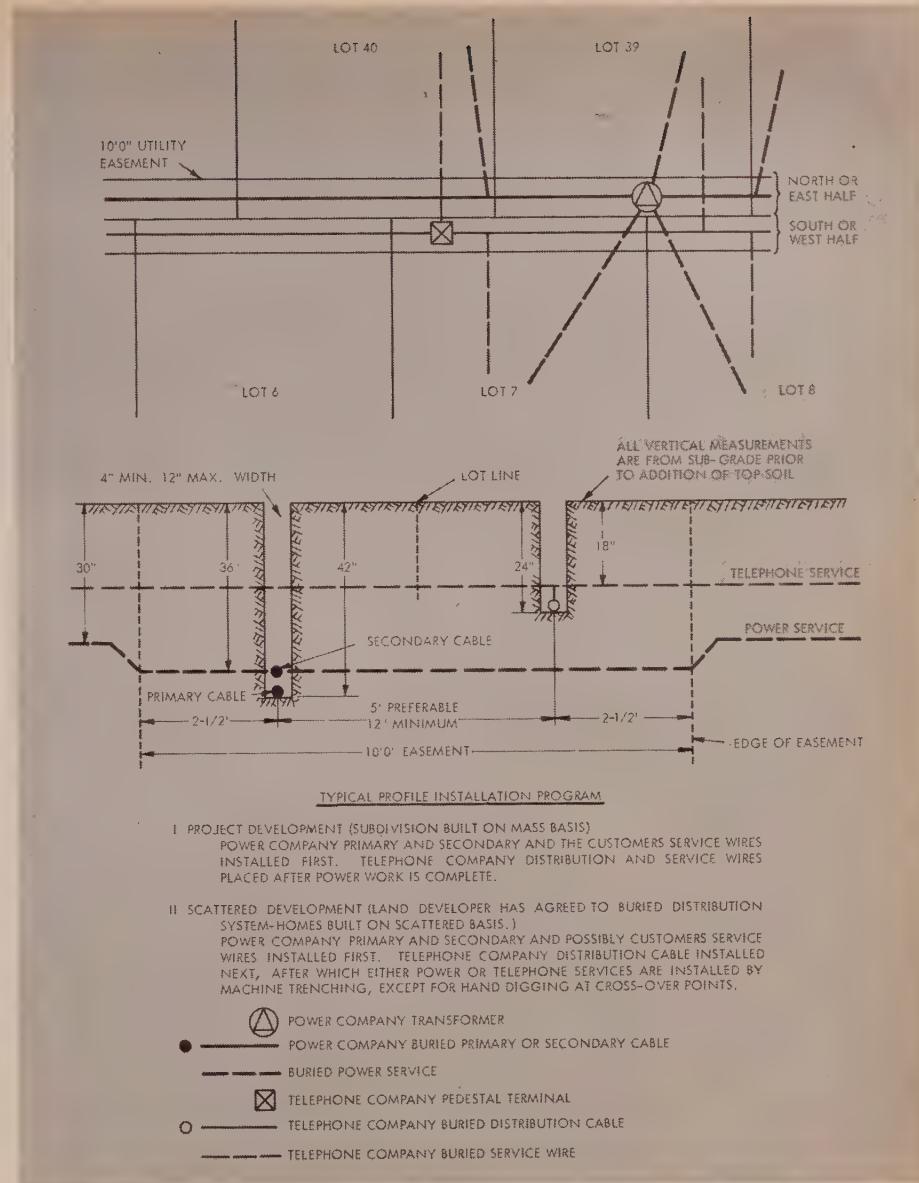


Fig. 4—Sketch showing joint use of right-of-way easement for residential underground.

18" depth both inside and outside of easements.

- (c) The Power Company secondary and primary cables shall be at 36" and 42" depths respectively.
- (d) The Telephone Company distribution cable shall be at 24 inches depth.
- (5) Where installations are to be made in easements at the front (street side) of lots, the perimeter rule (No. 1 above) shall apply, subject to mutual agreement and coordination with gas, water and sewer interests.
- (6) No installation shall be made by either the Power or the Telephone Company until easements have been cleared

and subgrading has been completed. This permits free movement of mechanical digging equipment over fundamental paths for both feeder and service wires.

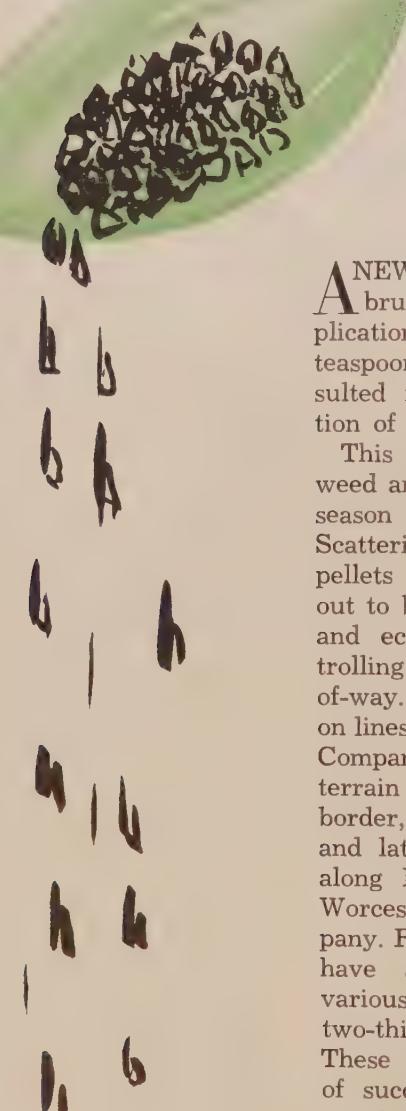
#### Trenching Machines

Trenching machines are now available from nine manufacturers to do the necessary trenching for any type of residential underground system. Fig. 5 shows one of these machines in the lightweight class powered by a 9½-hp gasoline engine. This machine digs a 4" wide trench 42" deep and deposits the dirt on either side of trench. It will operate in either direction. We actually timed this machine and found

(Continued on page 68)

## NEW CHEMICAL

# FOR RIGHT-OF-WAY BRUSH CONTROL PROVES EFFECTIVE, ECONOMICAL



The ease and efficiency of a new approach to brush control promises savings and convenience in right-of-way maintenance. Reduced investment in spray equipment is one of major economies foreseen as system is more widely accepted.

A NEW approach to chemical brush control, with choice of application equipment ranging from teaspoons to helicopters, has resulted from commercial introduction of a new pelleted herbicide.

This material, "Dybar" fenuron weed and brush killer, had its first season of commercial use in 1958. Scattering the  $\frac{1}{8}$ -in. cylindrical pellets by the spoonful has turned out to be one of the most effective and economical methods of controlling brush on power line rights-of-way. This has been demonstrated on lines of the Maine Public Service Company, running through rugged terrain close to the Canadian border, and in a program of tests, and later commercial applications, along Massachusetts lines of the Worcester County Electric Company. Reports of similar experience have also been received from various other parts of the Eastern two-thirds of the United States. These reports cover specific areas of successful use. Studies underway in other areas should define the optimum time of application and rates required to effectively control brush.

### Tests

One of the most complete reports of experience was given at the 1960 Northeastern Weed Control Conference by custom applicator Robert

N. Smith, of Gould and Smith, Inc., Presque Isle, Me.

"... In 1959, we used this fenuron weed and brush killer under contract with the Maine Public Service Company on over 300 brush acres of 100-ft right-of-way running from Fort Kent to New Sweden. This was compared with a similar right-of-way, 50 ft wide, from New Sweden through Caribou to Presque Isle, where we used 2,4,5-T in oil in basal stem application with knapsack sprayers, in a strip alongside the pellet-treated area. These lines are 7 to 9 yr old. Practically nothing had been done to the brush along the right-of-way since the original cutting; and it was 8 to 15 ft high, averaging nearly 5,000 clumps to the acre with some stems as big as man's wrist. Rough terrain and deep ravines made it difficult to spray, even with knapsack sprayers."

### Pail and Teaspoon

"Application of the pellets was very simple. We used a 10-man crew plus a tractor-driver and a foreman. Each workman's only tools were a 10-quart pail and a plastic teaspoon. A tractor-drawn sled carried the main supply of chemical. The crew spread out across the right-of-way and just walked along throwing a teaspoonful every 3 ft. This gave a distribution rate of about 50 lb to

By L. A. CONN,  
Industrial and Biochemical Dept.,  
E. I. DuPont de Nemours & Co., Inc.

the acre. With this method of application, we covered 300 acres between June 15 and July 15, in spite of 10 days of rain.

"On a 6-mi stretch of the 50-ft right-of-way from New Sweden to Presque Isle, we treated a 35-ft width with pellets, and a 15-ft border with 2,4,5-T in oil. Four men with 2,4,5-T in oil on a 15-ft width could just keep up with six men working with pellets on 35 ft."

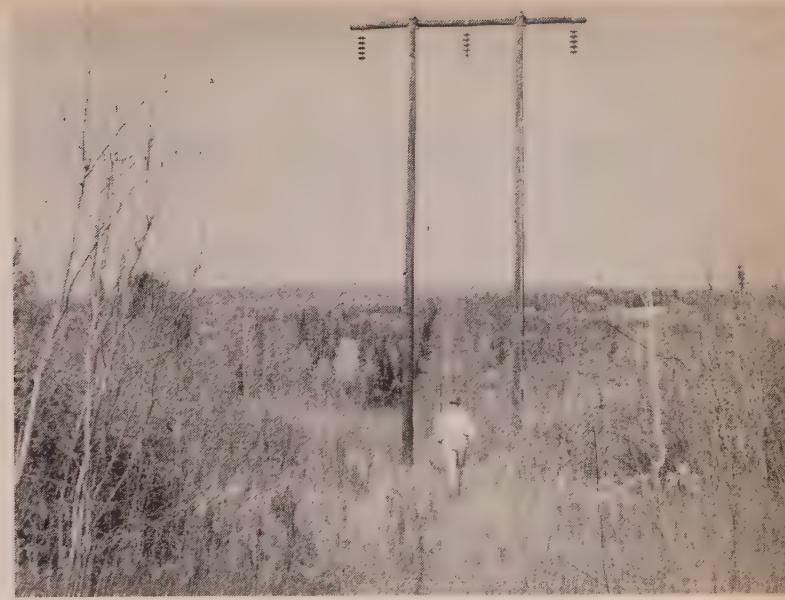
"We found that 50 lb of pellets to the acre performed as well as 100 gal of basal-spray mixture to the acre, which would weigh about 800 lb. The pellets are cleaner to work with than 2,4,5-T in oil. They are easier to carry and easier on the men's clothes. There is no smell to them, and crews can continue to work through light showers. Furthermore, it is easy to keep track of the amount of pellets used, because each man is using a 10-lb pail. Also, it is not necessary to hit every stem with pellet treatment as is necessary with basal-stem spraying. This fenuron weed and brush killer appears to have given good control of conifers, which have to be cut by hand when 2,4,5-T is used."

#### Savings

The big savings come from efficiency. Pellet application goes twice as fast in comparable terrain. On 300 acres treated with the pellets, each man averaged 1.4 acres per day, compared with 6/10 of an acre per man per day on comparable land treated with 2,4,5-T in oil. Another advantage is the saving on tank maintenance. Maintenance of 10 knapsack sprayers requires about six to eight man-hours per 8-hr day."

#### Tests Began in 1956

A large part of the data which led to selection of this fenuron weed and brush killer for the Maine contract consists of a cumulative series of records on 90 test plots established since 1956 in Worcester County, Mass. These studies have been reported three successive years at the Northeastern Weed Control Conference. In his report at the 1960 conference, William I. Boyd of the Du Pont Company summarized the main findings in the four years of observations.



Maine Public Service right-of-way in Northern Aroostook County treated with fenuron weed and brush killer in July 1959, and photographed October 1, 1959. Note control obtained in conifers and mixed hardwoods.



Brazos Electric Power Cooperative Inc., right-of-way near Hearne, Texas, treated with airplane application of fenuron pelleted weed and brush killer at 30 lb per acre April 7, 1958 and photographed October 13, 1958.



Pelleted weed and brush killer can be simply applied with spoon to the base of brush clumps—or it can be broadcast to larger areas.

1. Rates as low as one teaspoon of pellets per cluster gave effective commercial brush control by the end of four growing seasons. Higher dosages (up to one tablespoon per cluster) gave almost twice the kill at the end of the first season; but after four seasons there was no significant difference in results between the high and low dosages. In commercial practice this means that extremely low dosage is effective if there is no need for quick kill of the brush.

2. The season of application did not make any difference in results.

3. There was no interference with desirable ground cover. Low-growing plants, such as grasses, blueberries, bracken fern, and various weeds, became established soon after treatment.

4. Observations indicate that one application would maintain effective control of undesirable brush for six to eight years.

#### SEE Report

At the Southeastern Electric Exchange in Atlanta in October 1959, William K. Bailey of the Du Pont Company reported:

"In the Southeast, one or two tablespoonsfuls of this fenuron weed and brush killer per brush cluster is used in spot application. Effective top kill and root kill have been obtained on right-of-way with scattered brush using this spot treatment with as little as 20 to 25 lb per acre and two to three man-hours per acre for application. In dense stands of brush, broadcast application would be more economical and referred (at rates of 50 to 75 lb per acre). In light to moderate stands, spot treatment would be most desirable. It may be applied for brush control at any time of the year, but best results may be expected from late winter and early spring applications."

George M. Blankenship, president of Utility Line Clearance and Chemical Company, Cullman, Ala., says: "This fenuron weed and brush killer has given us an additional tool to use in the electric cooperatives' chemical brush control programs. We are using it in conjunction with our spraying, cutting, and trimming operations on brush scattered on rights-of-way, on fence rows, and in

inaccessible areas. This use has reduced hose dragging, eliminated removing large brush along roadsides and fence rows, and lowered job cost to our customers."

#### North Central Results

Effect of soil type on results with fenuron was one of a number of factors reported by J. W. Herron of the University of Kentucky at the North Central Weed Control Conference in December 1959. On the basis of observations one and two years after treatment, Dr. Herron reported that in general, treatments with comparable rates of fenuron on sandy loam soil were more effective

than treatments on heavy clay. This was especially noticeable during the first growing season after spring applications.

Dr. Herron has also found that fenuron pellets applied around freshly cut stumps of several species of trees were effective in reducing resprouting.

#### Aerial Application

Airplane and helicopter applications of fenuron weed and brush killer promise the same results as ground application, with unique advantage for special situations. For example, it was applied by airplane

(Continued on page 69)

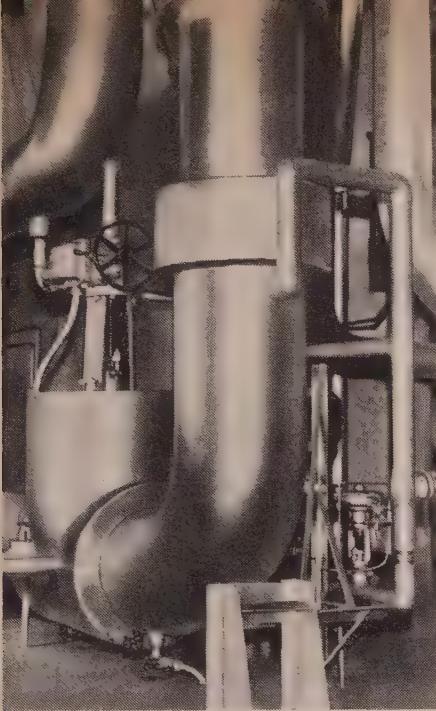


Helicopter is promising for large-scale application.



Darkening wood when bark is stripped away shows evidence of kill.

# CRITICAL PROBLEM SOLVED IN STEAM-HEAT DISTRIBUTION



Variable-orifice desuperheater inside vertical section of pipe supplies 20,000 to 300,000 pounds of steam per hour to Philadelphia Electric steam-heat network. Automatically-controlled flow of desuperheating water enters under the flange.

**S**ELECTION OF a desuperheater to reduce the temperatures of low-degree superheated steam, supplied at a low-flow requirement from the Schuylkill Station to a steam-heat distribution system, gave the Philadelphia Electric Company a critical problem.

The initial function of the desuperheater is to deliver 20,000 to 300,000 pounds of steam per hour at 420°F. It receives turbine-exhaust steam at 550°F and a pressure of 215 to 220 psig. Specifications required the desuperheater to maintain discharge temperature within plus-minus 5°F of the set-point, which might be 425°F to 475°F throughout the steam-flow range.

Our previous experience with various types of desuperheating equipment had shown that conventional types could not be used for this job because of the low superheat (approximately 30°F) and the low-flow conditions.

After extensive investigation we selected and installed a Variable-Orifice desuperheater. This new type of desuperheater was designed and is being manufactured by Blaw-Knox Company, Copes-Vulcan Division, Erie, Pennsylvania. It is a 12-inch, 300-psig standard unit with outlet expanded to 20-in. pipe size.

The installation is shown schematically by the accompanying line

By  
**GEORGE SVEREKA**  
Mechanical Engineering Department  
Philadelphia Electric Company

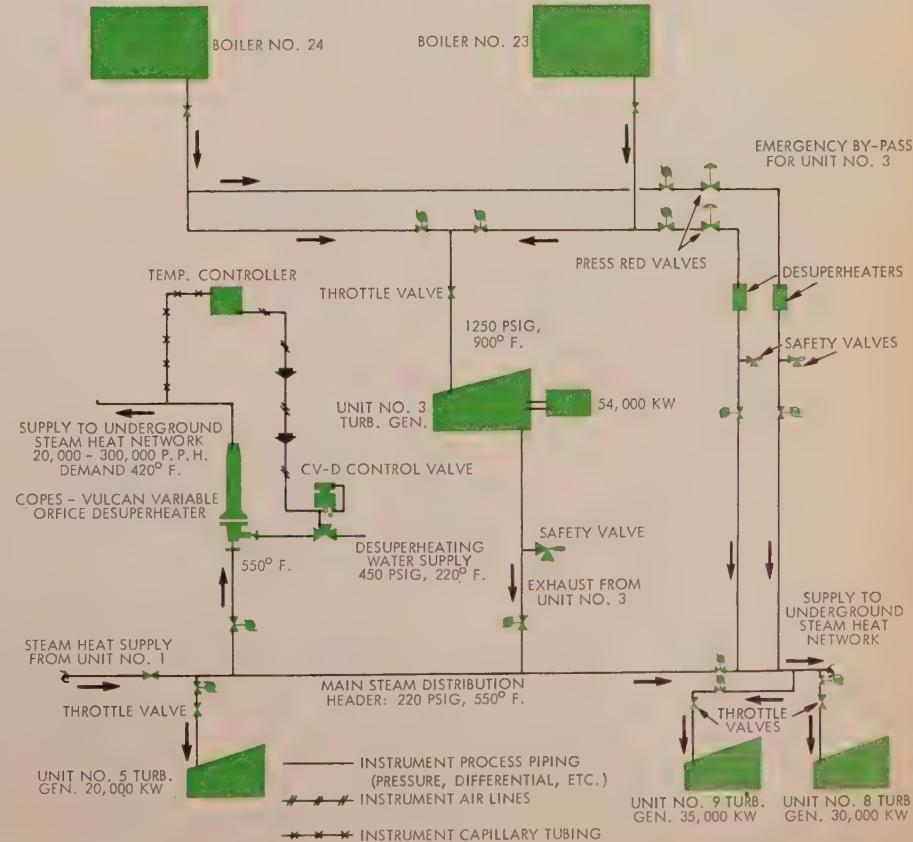
**Variable-orifice desuperheater solves Philadelphia Electric's problem in supplying a steam-heat distribution system from its Schuylkill Station.**

drawing. The desuperheater inlet is connected into the main steam-distribution header carrying steam at 220 psig and 500°F. This steam supply comes from the exhausts of turbine-generator units Nos. 1 and 3.

The desuperheating water supply is shown at 450 psig and 200°F. The specified pressure range is 425 to 475 psig. Water flow is automatically regulated by a Copes-Vulcan Type CV-D valve which is operated

(Continued on page 71)

Schematic control diagram of steam-heat system at Philadelphia Electric's Schuylkill Station.



## WHY NOT HERMETICALLY-SEALED SINGLE-PHASE WATTHOUR METERS?

A Guest Notebook Editorial  
By W. H. FARRINGTON, Staff Meter Engineer  
Texas Electric Service Company  
Fort Worth, Texas

In the past 12 to 15 years, greater developments and improvements have been made in single-phase watthour meters than in all previous years.

A few of these developments and improvements are as follows:

1. The capacity of the meter has been extended.
2. The bearing system has been improved.
3. There are fewer screw or bolt type connections to give trouble.
4. The meter is more corrosion-resistant.
5. They have better insulation as a protection against breakdown.
6. Magnets have been improved.
7. Gearing has less friction for longer periods of time.
8. The meter holds its calibration within acceptable limits for indefinite periods of time.
9. They are received from the manufacturer in such condition that they can be accepted without test.

All of these items, and more that are not mentioned, have made it possible to extend test periods far beyond what was thought possible 12 or 15 years ago. Now the trend is toward sample meter testing which, in a great many meter engineers' opinions, will be the generally accepted test method within a few years.

In order to further improve the meter, it could be so designed that dust, moisture, insects, etc., could not collect. The cover should be manufactured from material that would retain the advantages of glass but would practically eliminate breakage.

This could be accomplished by the use of a hermetically-sealed completely molded base including the present cover, with the exception that a heavy, protected glass or plastic material would be included for reading purposes.

How will minor repairs and adjustments be made? It is not intended that they will be made, because it is believed that they will be practically eliminated by more improvements that could be expected to be possible with the use of a hermetically-sealed meter.

A survey, on our system for one year, of all trouble reported on single-phase meters, revealed that only four percent were of a major nature. Practically all of the 96 percent of minor troubles could have been eliminated by an improved hermetically-sealed meter.

Since minor repairs and adjustments will not be made, some of these improvements could be:

1. Elimination of all screws and bolts that could possibly cause trouble.
2. No adjustments for calibration would be provided, or needed.
3. All screws and adjustments for bearings would be eliminated.
4. Stators, magnets, frame, register, etc., would be welded, riveted or molded.
5. All replaceable gaskets would be eliminated.

These and many more improvements of which would be thought in designing such a meter would, for all practical purposes, eliminate the necessity for making minor repairs, which is the reason in the great majority of instances for having to test the meter.

There would be some major troubles, such as damage by lightning, damage by falling or being hit by something. Such meters would be retired without an attempt to repair. For these types of major repairs, it is generally found now that they cannot be repaired economically.

## RUBBER-TIRED DOZER SHUTTLE MAINTAINS DIVIDED COAL PILE

A rubber-tired dozer is solving a problem imposed by an eight-lane freeway which separates the two generating stations and coal stock-

piles at the City of Cleveland's Municipal Light Plant.

The shortest distance between piles is a one-and-one-half-mile route



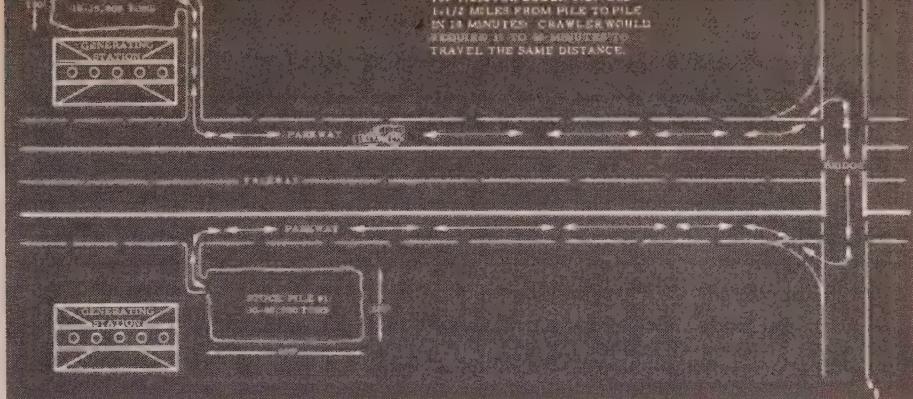
Danger of fire has been minimized by the good compacting characteristics of the 15-ton tractor-dozer.

via a parkway which parallels the freeway to a bridge and then back to the second plant (see sketch).

Plant Superintendent George Paraskeva was bothered with using two crawler tractors to handle the coal stockpile work, when one larger machine could do the job.

Mr. Paraskeva's solution was to replace his two crawlers with a single 165-hp rubber-tired tractor dozer. He found that the rubber-tired rig can make the one-and-one-half-mile trip between stockpiles in 10 minutes or less—with no time lost for loading and unloading.

"Compared to the crawlers," he said, "the rubber-tired rig is doing a better job due to its higher for-



Eight lanes of freeway traffic separate the two generating plants and coal stockpiles at the City of Cleveland's Municipal Light & Power Plant. To maintain the two stockpiles with only one machine, Plant Superintendent George Paraskeva replaced his two crawler dozers with a single rubber-tired tractor-dozer.

ward and reverse speeds. We timed it on a typical 200-ft-long, 15 percent

grade and it dozed three tons per bladeful per minute."

## CIRCUIT BREAKER LIFTER IMPROVES SAFETY — CUTS MANPOWER

By W. J. BUCHANAN, JR.

Maintenance Supervisor  
Kanawha River Plant  
Appalachian Power Co.  
Glasgow, W. Va.

A newly-developed mechanical lifter has solved the problem of handling 600-v drawout air circuit breakers at the Kanawha River Plant of Appalachian Power Co. With this homemade breaker han-

### MANPOWER

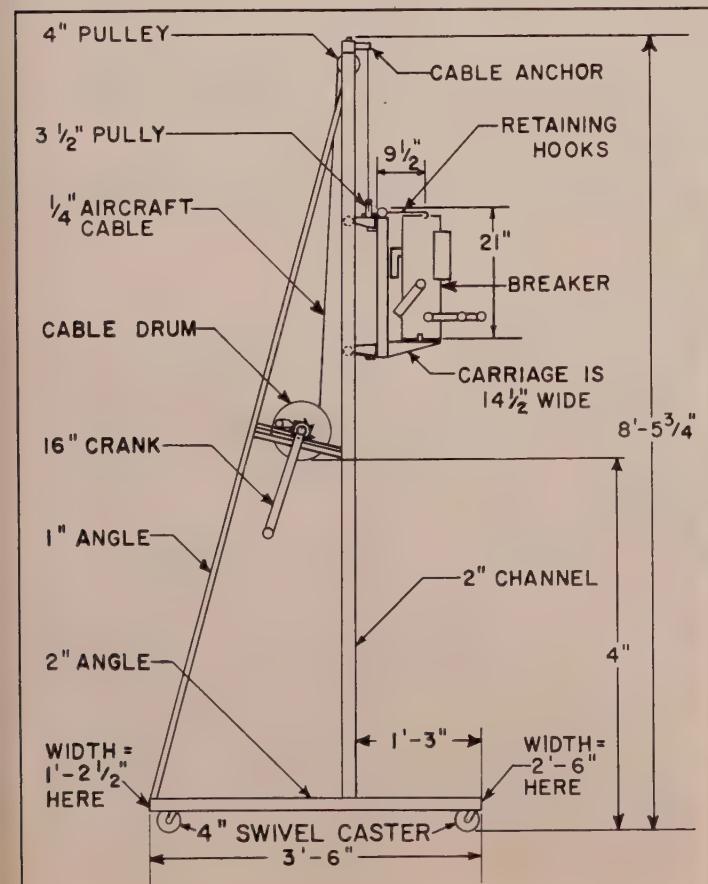
dling rig, one man can easily and safely remove or replace any one of the 34 GE type AK-1-25 air circuit breakers which are arranged in cubicals at four different heights.

Before the rig was developed, installation and removal of breakers was a difficult handling problem. At least two, and quite often three men were needed. Even with three men, this operation was quite awkward and even hazardous, especially if the

breaker was near the top of the cubicle.

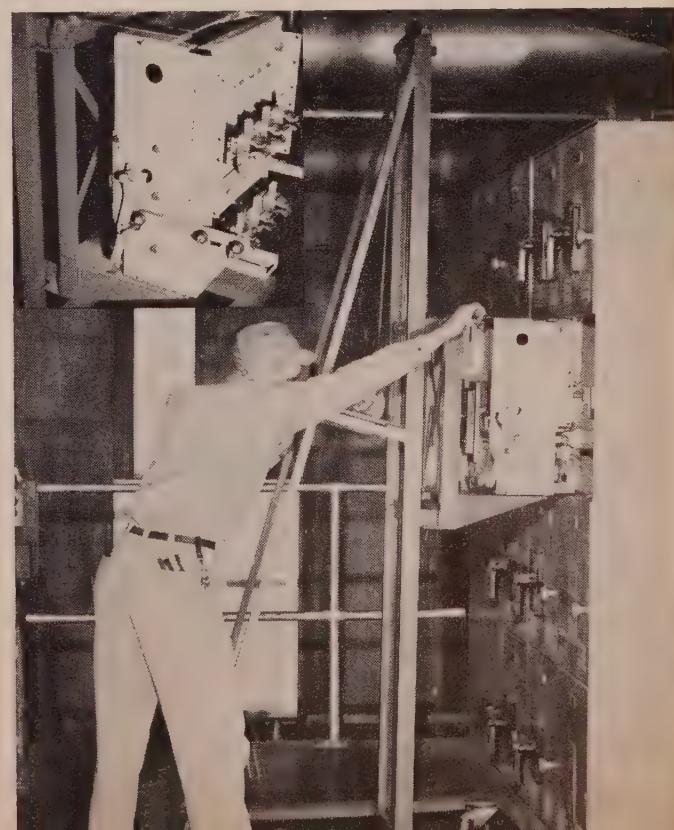
Total cost of the lifter was about \$200. It will pay for itself with manpower saved in about two years. The most important benefits, however, are improved safety and convenience.

Plants having monorails already installed may find this lifter unnecessary. It would be much cheaper, however, to have one of these lifters to serve several groups of breakers than to install monorails and trolleys at each location.

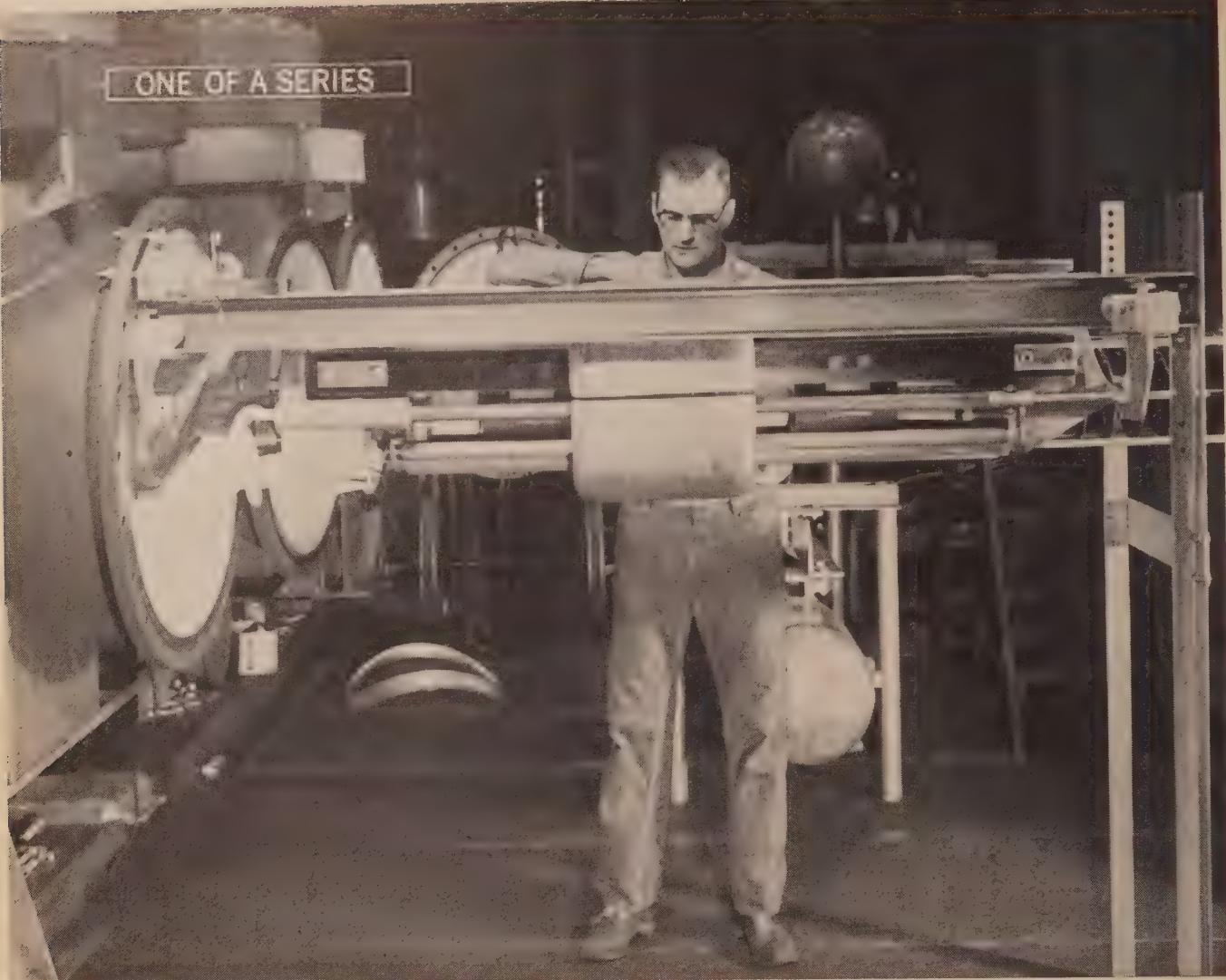


New mechanical lifter enables one man to safely lift the breaker from the cubicle. Carriage is adjusted to breaker elevation by turning crank. Inset shows top bracket with retaining hooks.

Construction outline shows how carriage rides up and down on rollers inside 2-in. channel.



ONE OF A SERIES



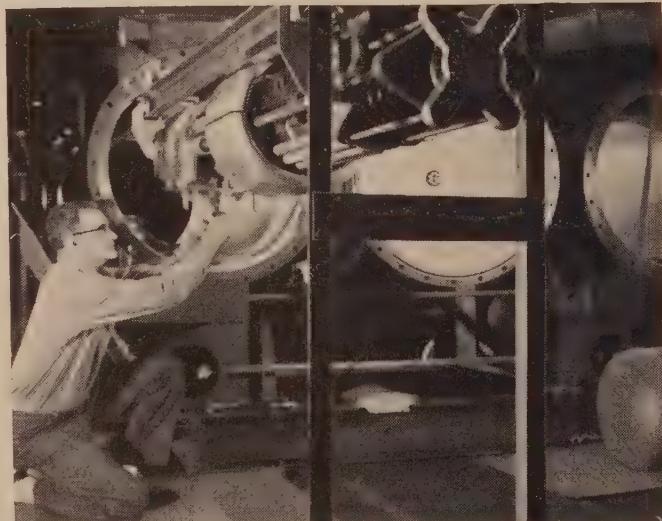
## New, Easy, Ground-level Inspection of SF<sub>6</sub> Gas Breaker Slashes Maintenance Costs

provides greatly improved performance from 69 to 460 kv and beyond

A unique horizontal interrupter design in the new Westinghouse gas power circuit breaker now brings the interrupters within easy reach of the maintenance man. No scaffolds, block and tackle or ladders are required to inspect breaker contacts. Now workmen can perform all maintenance comfortably . . . from the ground!

The interrupter can be removed from each tank of the Westinghouse breaker in just 15 minutes.

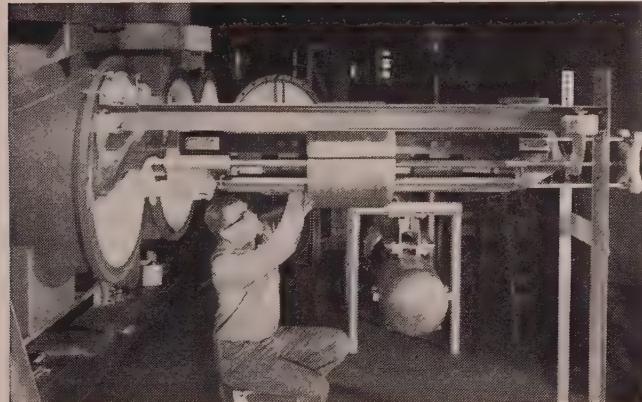
After evacuation of the SF<sub>6</sub>, a set of lightweight aluminum rails is installed inside the pole unit. Trolleys are attached to the interrupter; bolts are removed at the bushings, operating rod and high-pressure tube. The interrupter can then be pulled out for inspection. There is no heavy equipment to be lifted! There is no easier way to remove an interrupter.



Operation of the interrupter is easily checked by attaching a jack and opening and closing the contacts by hand. This convenient operation-check is another cost-saving advantage over other breaker designs.

The advanced interrupting techniques developed in this new gas breaker, improved contact design and efficiency of the SF<sub>6</sub> (sulfur-hexafluoride) interrupting medium combine to *reduce the need* for periodic maintenance to a fraction of present accepted practice. *Over-all* maintenance costs of the Westinghouse gas breaker are estimated to be less than half those of other breakers.

Extensive field and laboratory experience (since 1953) has proved that SF<sub>6</sub> is completely safe to use



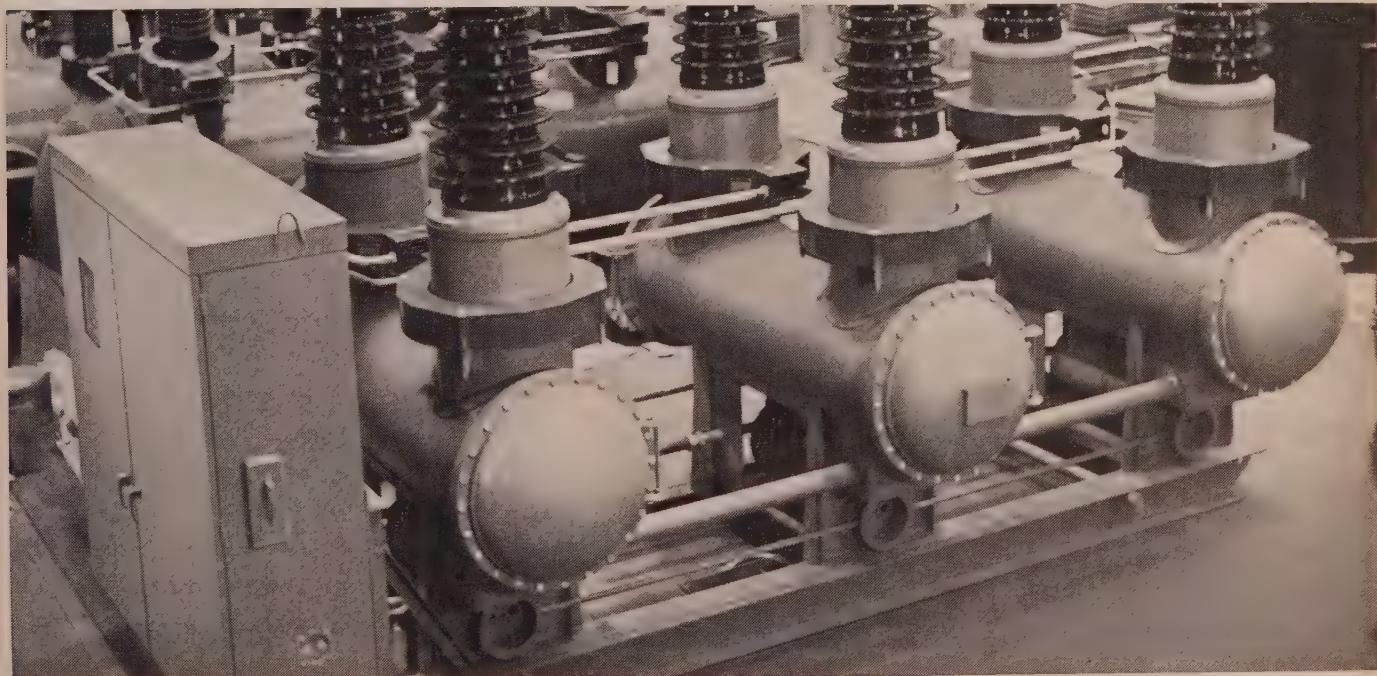
without any harmful effect on personnel. Only precautionary measures of the common-sense variety are recommended. The gas is carefully filtered by activated alumina, as it is circulated in the breaker high- and low-pressure systems, to remove any gaseous arc products. Any solid arc products left in the pole unit after evacuation can be quickly blown out



with compressed air.

This inert, nonflammable, nontoxic gas is heavier than air as demonstrated in the laboratory experiment above. The SF<sub>6</sub> sinks to the bottom, snuffing out the candle. Tests show that the mice can live in a mixture of 80% SF<sub>6</sub> and 20% oxygen for 24 hours without ill effect.

To learn more about the way the Westinghouse gas breaker can cut installation and maintenance costs and increase breaker performance, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse. J-61006



Westinghouse Gas Breakers for Improved Performance  
from 69 to 460 Kv and Beyond

Westinghouse



**hang it**



**tie it**



## Rust and Corrosion Research

## Experiments Show Hydrogen Cause of Rust: Discount Electrochemical Theory

Hydrogen ions, or protons, long thought to be one of the basic building blocks of matter, in fact be the destructive cause of corrosion of iron, according to a new theory revealed by Westinghouse researchers Dr. Earl A. Gulbransen and T. P. Copan.

Formerly, the standard explanation for iron corrosion has been that it is an electrochemical reaction, somewhat similar to that which occurs in an ordinary battery. Tiny local areas on the surface of the metal are assumed to act as plus and minus electrical terminals under the influence of an invisible liquid film of water, generating minute electric currents that corrode the iron. The new theory suggests that something more basic may take place in the iron itself, even an electrochemical reaction may also be present.

The two Westinghouse scientists believe that tiny hydrogen particles penetrate the iron and enlarge the sites at which oxygen normally

combines with the metal. This spreads the reaction throughout the surface of the iron, causing it to rust destructively.

In experiments, using pure iron wires about as thick as a fine sewing thread, reactions with oxygen and water vapor at high temperatures (835 F) were studied under an electron microscope.

The scientists report that with dry oxygen the iron forms a protective oxide coating from which grow billions of tiny round oxide whiskers less than one-millionth of an inch in diameter and 30-millionths of an inch high, each from a specific growth on the wire's surface.

With water vapor substituted for the dry oxygen, a startling change takes place. From the growth sites erupt thin, pointed, blade-shaped platelets of iron oxide. They are one-millionth of an inch thick, 30-millionths of an inch wide and 300-millionths of an inch high. As they grow in size they spread more than 50 times in area over the sites observed for dry oxygen, reaching a density of nearly one-billion per square inch of surface. The amount of rust they represent is 250 times that which forms when the water vapor, and the hydrogen ions it releases, are absent from the reaction.

The experiments show that less than one-part water vapor in 200 parts of dry oxygen will cause the blade shaped crystals to form. At room temperature this would correspond to a relative humidity of about 3 percent.

Dr. Gulbransen stated, "We conclude that the hydrogen ions in the water vapor enlarge the areas of chemical reaction between the oxygen and iron and bring about the



In an atmosphere of pure water vapor, the surface erupts into thin blade-shaped oxide crystals. As the blades grow in size, they spread across the surface of the iron, causing it to corrode destructively. This photomicrograph is at the same magnification as the one at left.

metal's greatly increased corrosion. . . . Already we can identify two control measures which must be considered in addition to any electrochemical effects that are involved in iron rusting: Hydrogen must be prevented from entering the metal, and the growth of the localized reaction sites must be inhibited by the addition of suitable alloying elements to the iron."

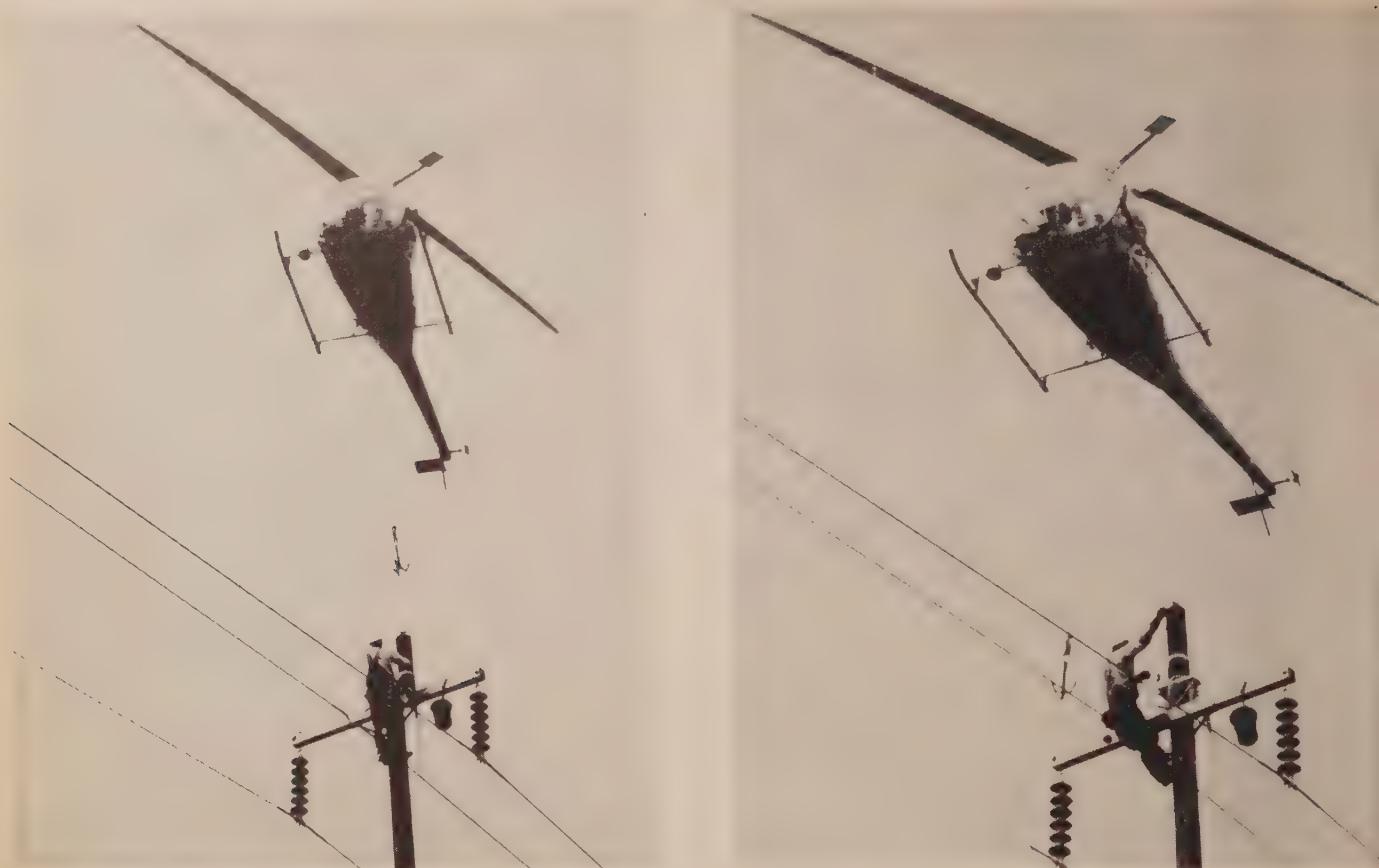
## Bicks Promises "Fullest" Antitrust Cooperation

"Fullest cooperation" of the Antitrust div. with state officials in their "search for an effective solution to the nagging problem of identical bidding which plagues so many insignificant sectors of government procurement" has been promised by the Justice Dept.'s antitrust chief, Robert A. Bicks. In connection with the antitrust cases pending against some electrical equipment makers,

(Continued on next page)



# PGE Airlifts Insulators; Speeds Up Conversion



**We're busy as a one-armed paper hanger—making**

## **SUPERIOR EQUIPMENT for the UTILITY INDUSTRY**

*but we will never  
compromise with quality*

**SUPERIOR**  
SWITCHBOARD & DEVICES CO.

CANTON, OHIO

A subsidiary of  
The Union Metal Manufacturing Company

Socket Equipment • Test Switches • Test Blocks • Enclosures

### **BICKS PROMISES . . .**

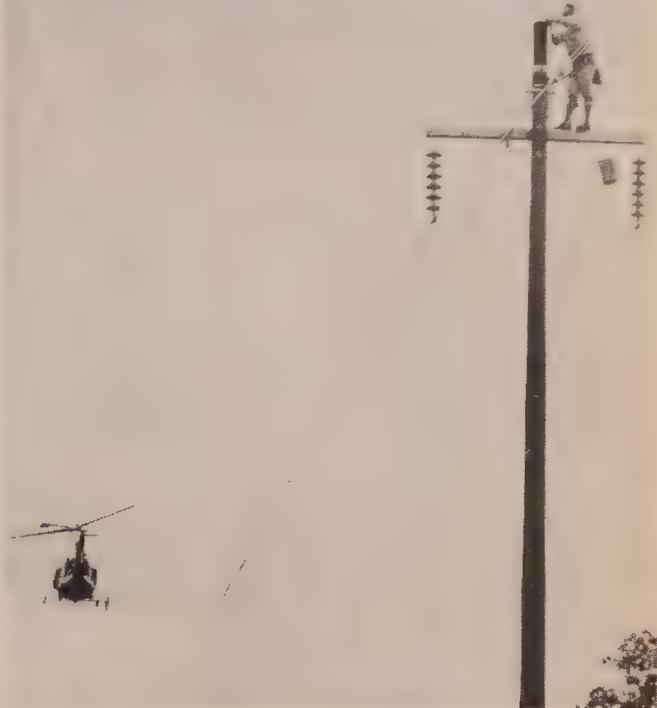
(Continued from page 63)

Bicks says that it is contemplated that damage suits will be filed "where the volume of government purchases was large." The Antitrust div.'s consent judgment practices have been changed to include admissions of the allegations contained in the government's complaint where local governments have "borne the brunt of the violation alleged and where the state has filed or indicated its intent to file damage proceedings under the antitrust laws."

Meanwhile, another indictment—this one in connection with the sale of power capacitors—has been returned by the Federal Grand Jury in Philadelphia. Six firms are charged with fixing prices, terms and conditions of sale "by quoting to electric utilities and public agencies, in submitting bids and quotations . . . only the prices for power capacitors as agreed upon." Defendants are: Cornell-Dubilier Electric Corp., General Electric, McGraw-Edison, Ohio Brass, Sangamo Electric, and Westinghouse Electric.

When Portland General Electric was recently faced with the task of replacing 235 lb. insulators on a line with a higher voltage, they employed Columbia Helicopters, Inc. to do the heavy work. First step was to lift the conductor off the old insulator with the grappling hook slung from the ship's belly. Lineman would then lower the old insulator to the ground. New, heavier insulator was hoisted in position while lineman bolted it into position (far left). After insulator was securely mounted, the grappling hook was again used

to hoist the conductor back into place (left center). After replacing the conductor on three newly equipped poles (right center), the copter removed the line for the next three (far right). Note the loud-speaker on the skid gear cross arm. Its audible range is half a mile. Crews use arm signals to direct the pilot; the pilot replies by way of the public address system. Crews using gin poles could formerly make only four installations per day; the helicopter and four men changed 29 insulators in 3 hrs 40 min.



## Some Up, Some Down

## More Price Realignments Made

A realignment in apparatus bushing prices has been effective since September 14, according to General Electric's power transformer dept. The price changes, mostly downward, but some upward, average a five percent reduction for TBI (Transformer Breaker Interchangeable) and other ASA bushings. At the same time, prices of most non-standard bushings have been increased by an average of 20 percent over the entire range.

A minor adjustment in G-E's prices in effect since September 19, saw station arresters reduced approximately 1.2 percent on all ratings, and intermediate arresters reduced approximately two percent on all ratings.

Westinghouse Electric Corp.'s power circuit breaker dept. reduced catalog prices from eight to 39 percent on floor-mounted, oil-filled power circuit breakers; 20 to 50 percent on frame-mounted break-

ers; and 26 to 47 percent on single-tank distribution breakers. Indoor oil breakers are not affected.

In addition, prices are being published for the first time covering available ratings of the new SF gas breakers. These prices are higher than newly published oil breaker prices.

### Open IBM Exhibit of Advanced Machines

International Business Machines Corp. has opened the doors of a new "Solid State Showcase" of advanced computer equipment in its Product Display Center in New York.

Five solid state machines are included in the display: The IBM 1401 and 1620 Data Processing Systems, 609 Calculator, 108 Card Proving Machine, and 84 Sorter. The 1401 is the company's most popular solid state computer, with about 3,000 orders since its introduction last October.



Your volume orders for nearly 400,000 failproof Precision controls have cut our costs. You save with a price that puts Precision on every pole! The new Multiplex is all Precision but costs less than untried controls!

Guaranteed—backed by more field-service than high priced controls.

*Failproof*—embodies the original Precision 2-component circuit, field proven on nearly 400,000 installations.

Convenient—smallest, simplest quality control made; fits all NEMA heads.

Write or wire for quantity discounts on \$12.70 Multiplex Controls—today!



**PRECISION**  
MULTIPLE CONTROLS

Pioneers In Automated Lighting Control  
233 CHESTNUT RIDGEWOOD, N. J.

## NEW PRODUCT

## DESIGN

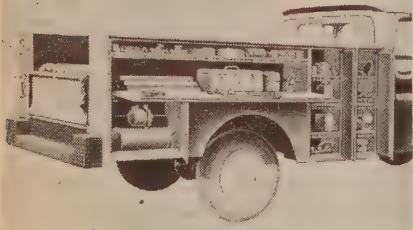
### Sangamo Extends Magnetic Flotation Meter Production

Sangamo Electric Co. has introduced true magnetic flotation in two and three stator Types P20 and P30 polyphase watthour meters. This marks another step in expanding the newly developed magnetic flotation system into all types of Sangamo a-c watthour meters. The flotation system consists of two bonded cylindrical Alnico magnets located below the disk, positioned so that their magnetic fields support the disk. Graphite rings Cobenium pivots guide the disk. The new flotation system, plus slow speed and high torque characteristic in Sangamo meters, improves sustained accuracy, according to the manufacturer. The new meters possess the same electrical characteristics as the superceded P2 and P3 meters. All components have



more than adequate surge resistance. Meters will easily pass 20,000 amps through the neutral wire and 2,000 amps through the current coil.

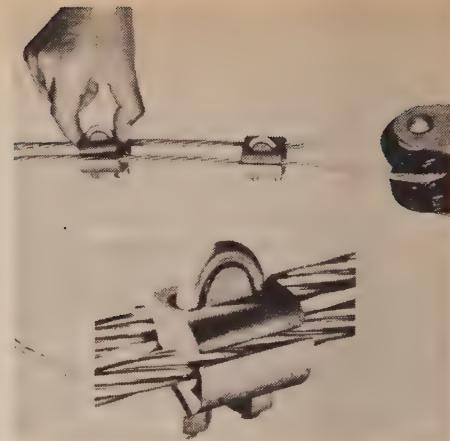
*Circle #23 on reply card*



### Utility Bodies

Unitized welded construction is featured in a new series of utility bodies job-planned for greater efficiency. By **Reading Body Works, Inc.**, the new series employ "Magic Stowaway," which enables users to change compartment arrangements to meet changing load requirements. All shelves are removable and are equipped with removable adjustable dividers. Capacity ranges from 35 cu ft in half ton models to 68 cu ft in one-ton models.

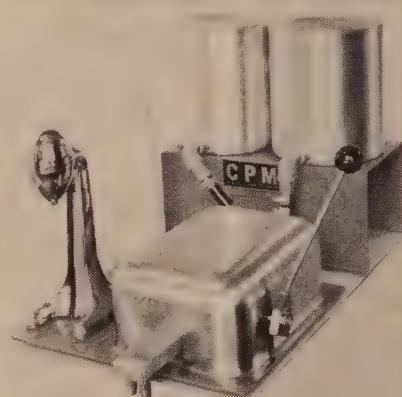
*Circle #24 on reply card*



### Loop Deadend Clip

Alcoa's Rome Cable division has introduced a loop deadend clip that affords easier, quicker loop deadend installation by way of its unique design. U-bolt has been rotated, increasing convenience. Disassembly is not necessary for installation. Designed for use with ASCR, sizes #4 through 1/0 and for stranded aluminum of comparable size, it may be used on loops formed over either spools or thimbles.

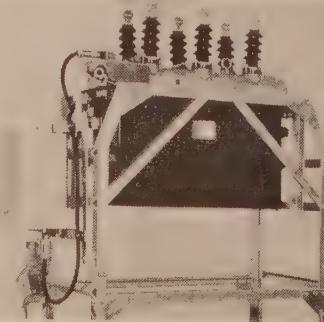
*Circle #26 on reply card*



### Electronic Recloser

The first known electronically controlled oil circuit reclosers are now offered by **Line Material Industries**. Designated Types RE and WE, the reclosers offer the same features of previous units, plus increased flexibility, testing, and adjusting. Type RE is rated 400 amps continuous and can interrupt 4000 amps at 14.4 kv. Type WE can carry 560 amps continuous and interrupt up to 8000 amps at 14.4 kv.

*Circle #25 on reply card*



### Epoxy Resin Mixer

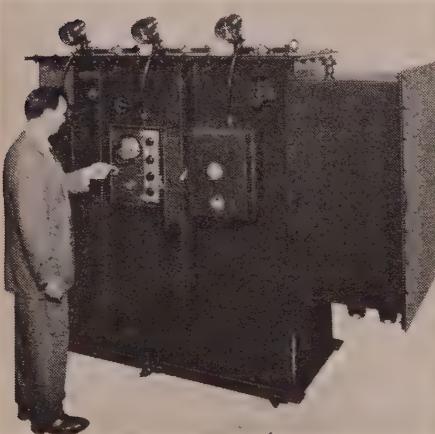
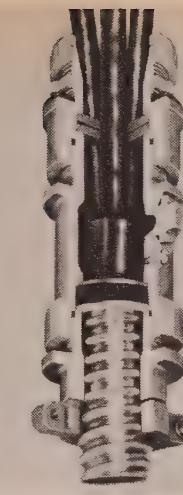
Multi-Rez-Processor is designed to simplify the use of two-part epoxy and polyurethane compounds. The unit will proportion, dispense, and mix multi-mix component reactive resins. There are no cleaning or purging problems as it is impossible for the equipment to freeze up. Short pot-life resin mixes can be handled with ease. Equipment is sold as a complete unit and is shipped ready to run. By **CPM Special Machinery Corp.**

*Circle #27 on reply card*

## Three-Phase Regulation

Tri-Unit Regulator, by Pennsylvania Transformer division, McGraw Edison Co., consists of three standard distribution Pole Star regulators, each a fully-automatic, self contained unit, combined in a single tank. Provides the economic and operating advantages of independent phase regulation, compared to regulation with three-phase gang control. Rated 15 kv and below. Regulation is plus and minus 10 percent in 32 steps of  $\frac{1}{8}$  percent.

Circle #28 on reply card



## Cable Fittings

Series 800 fittings not only terminate, but also support, mount, ground, and dead-end all interlocked armor cable. Fittings are available in four basic pipe sizes; eight fittings in each size for various applications. Fitting seals to cable and to junction box are positive through use of Resistoyl® gaskets. High strength aluminum is used for all parts. Manufactured by G&W Electric Specialty Co.

Circle #30 on reply card

## Strain Insulator

A strain insulator by Delta-Star Electric division of H. K. Porter Co. is said to cut dead-ending costs. For use on lines up to 12.47 kv, the new unit cuts costs up to 40 percent. One unit can be used instead of the usual two six in. or one 10 in. without fear of burning crossarm or pole. Tubular contour almost eliminates fissure during handling. Impact forces are spread over the entire body instead of on a single porcelain projection.

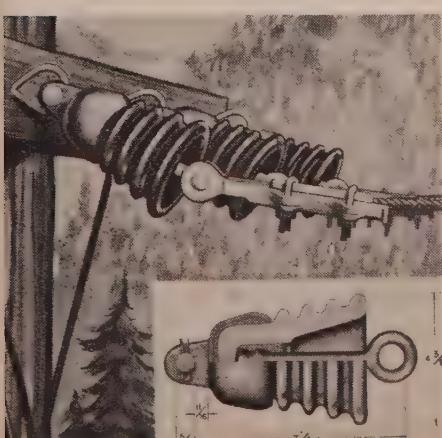
Circle #29 on reply card



## Station-Class Arresters

Ohio Brass Thorex station class lightning arresters are now enclosed in one-piece porcelain housings for all sizes from 3 kv up to and including 276 kv ratings. Previously, the larger porcelain housings were cemented with epoxy resin between sections and reinforced with metal bands. Units are immune to contamination-caused internal damage resulting from external leakage currents, making possible "hot washing" like any station porcelain.

Circle #31 on reply card



\*Trademark



"Superforms\* handle well"  
... say CONSTRUCTION and  
MAINTENANCE ENGINEERS

"Superforms require no tools for regular use . . . they are readily adaptable for hot-line tools . . . they give us uniformity of application and result . . . they handle well!"

Construction and Maintenance Engineers . . . the men responsible for getting things done Fast, Right and at Low Cost . . . are making more and more use of Fanner Superforms, everywhere!

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FANNER  
Superformed  
with a

## "PROTECTIVE TWIST"

### ARMOR RODS . . .

Protect long-span T&D lines at supports

### LINEGUARDS . . .

Protect short-span T&D lines at supports

### PATCH RODS . . .

Repair damaged conductors

### TAP ARMOR . . .

Protects conductor at tapping points

### FANNGRIPS . . .

For dead-ending strands and conductors

### FANNSPLICES . . .

Join two ends of conductor wire

### PLASTIC PRODUCTS . . .

For conductor surface protection

## FANNER

The Fanner Manufacturing Co.  
Brookside Park—Cleveland 9, Ohio  
Division of Textron, Inc.

## THE CASE FOR RES. UNDERGROUND . . .

(Continued from page 45)

it dug a trench 42" deep at the rate of 180 feet per hour in light sandy loam soil. Rate of speed and cost per foot will vary widely depending on type of soil encountered. We have a light-weight machine similar to this one—but not this manufacturer—which we use for running underground service lines from overhead secondary. It does a very nice job.

The gas company in our city uses four of these light-weight machines for installing service lines and have advised us that they are well pleased with the low cost of operation and maintenance of the machines. We have explored the possibility of contracting the trenching and backfilling in residential underground systems and find we can get this done for 30¢ per foot. This appears to be more economical to us at present than purchasing a heavy-duty trencher for all types of soils and doing our own trenching.

### Summary

We feel there are many advantages of residential underground that outweigh the additional cost over conventional overhead:

- (1) It improves customer relations by helping the customer improve the aesthetic value and appearance of his property.
- (2) It costs less to maintain because it is less susceptible to storm damage, and the need for tree-trimming is eliminated.
- (3) Underground service promotes a loadbuilding program and higher customer utilization.
- (4) It improves service due to less exposure to the elements that cause interruptions.
- (5) It improves relations with home builders because of boost in evaluation by F.H.A.
- (6) It is more adaptable to curvilinear layouts used in many subdivisions. Every time an overhead line changes direction, the pole must be anchored, which raises the cost and poses a public relations problem.

Portable Cords (Type S, SO, SJ, SJO)

Remote Control and Drill Cords

## PORTABLE CORDS . . .

107 BY 107AYER

Portable Power Cable, Twin Type G (Hex-Shaped Parallel Conductors)

157 BY 107AYER

Locomotive Gathering Cable

107 BY 107AYER

Portable Power Cable 2-4 Conductor Type G 2-6 Conductor Type W

107 BY 107AYER

Shovel Cables (Classes A, B, C, and D)

Concentric Mining Machine Cable

Collyer Portable Cords and Cables fill a thousand and one needs . . . above and below ground . . . for light, medium and heavy duty applications such as power tools, shop machinery, welding apparatus, mining equipment. Collyer's capacity and know-how can meet your construction and service specifications . . . including resistance to flame, oils, solvents, moisture, crushing, flexing, abrasion. In every case, you'll find Collyer Portable Cords and Cables easy to install, longer-lasting, trouble-free.

For specifications, quotations,  
or engineering assistance, write

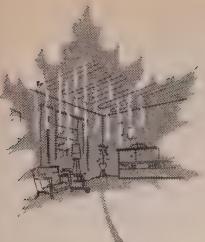
**COLLYER INSULATED WIRE CO.**  
**263 ROOSEVELT AVENUE**  
**PAWTUCKET, RHODE ISLAND**

# Collyer

(Continued from page 48)

## MONTREAL'S APPROACH . . .

(Continued from page 36)



To regularize this situation, a new rate was created and applied to all space-heating customers in the 1959-60 season.

The revenue per kwh realized from these customers was 1.45¢ in 1959-60.

The unit revenue obtained from the individual customers making up the group of 200 who occupy 6-room and larger homes, was usually found to be within the range of from 1.25¢ to 1.35¢ per kwh. There were a few cases where the return was below 1.1¢. The customers in this group make use of some form of peak-limiting control and so are able to effect economies beneficial to both themselves and to the supplying utility.

The customers in the larger group of 3300 live in small rented apartments wherein it is seldom feasible to install peak-limiting controls. Also in many cases, the landlord does not install a sufficient capacity of space heaters, thus compelling the tenant to make intermittent use of the electric stove for space-heating purposes, particularly at times of severe cold weather. These factors combine to produce unnecessarily high demands and tend to create high bills for many of these customers.

## Technique Used For Detection

A word should be said regarding our detection method. We wished to be fair in setting up an arbitrary detection standard both to the customer and to ourselves. Results seem to indicate a good degree of success.

We classify our customers as being space-heating customers if the ratio of their 6-month Winter consumption to their 6-month Summer consumption exceeds 250%. In a warmer climate, the ratio would be somewhat less and in some climates it would cease to warrant any special rate.

Average ratios in Montreal, based on thousands of cases, give

the following averages:

For ordinary non-space-heating customers the ratio of

$$\frac{W. \text{ Kwh}}{S. \text{ Kwh}} \text{ averages } 130\%$$

For customers space heating solely by electricity, the ratio of

$$\frac{W. \text{ Kwh}}{S. \text{ Kwh}} \text{ averages } 370\%$$

For the protection of those customers who use both electricity and some other heating medium and who have a ratio slightly higher than 250%, inquiry is made to find out if they were away for a prolonged period in the Summer season. If so, a pro-rata adjustment is made to their 6-month summer consumption.

A new ratio of  $\frac{W}{S}$  is then de-

termined. If the new ratio is 250% or less, reclassification is deferred. Customers heating solely by electricity, regardless of the ratio  $\frac{W}{S}$ , are placed on the space-heating rate.

We believe the justification for a higher rate for space-heating customers is (1) space-heating is a seasonal load; (2) it makes itself most acutely felt at a time when the system load is at its highest and also at times when our system capacity is suffering from loss of capacity due to severe winter weather conditions (these two things are usually coincident in our climate); (3) because of the nature of space heating, the opportunity for diversity between households, as far as their respective space-heating loads are concerned, is much more limited than is the case with other appliances used in winter.

We are not actively promoting domestic space heating because of the need to conserve expected capacity additions for foreseeable increases in the requirements of existing types of load. This condition is likely to continue for a number of years.

along a highline right-of-way near Hearne, Tex. Application was made with the plane flying just above the tops of the 50-ft poles. Even though the tests were put out on a gusty day in mid-April, deposition of the pellets was confined to the 60-ft right-of-way.

These tests indicate that a program using this chemical is well within practical operating economics, since effective control was obtained at a low per acre cost. The light sandy soil and predominance of oak species favored success of the broadcast method of application. Elsewhere, however, it appears that grid application or basal application is more practical. (Once a line has been established, the brush problem is generally scattered infestation ranging from 50 to 75 per cent brush density rather than a continuous dense stand.)

## Along Railroads

Agrotors, Inc., a custom helicopter application service, operated by Dr. Carroll M. Voss, Gettysburg, Pa., found considerable interest in trial applications, especially along railroads, and similar situations where it is difficult or impossible to operate from the ground. It is possible that some of these advantages may be found to apply to power line brush control problems.

Tried out last year on the Western Maryland Railroad, the helicopter appeared to offer broad possibilities for application of both wet and dry chemicals.

Carrying these fenuron weed and brush killer pellets, the helicopter had a payload of 500 lb, which was applied at 50 lb to the acre along 10 mi in about 20 min. The pelleted herbicide can be applied by helicopter even when the wind is blowing too hard for spraying with liquid.

The helicopter can operate at a controllable speed of 5 to 60 mph. About 30 mph is believed to be most effective providing a substantial downblast for chemicals. The helicopter can fly close to obstructions and wires, and the coverage and dosage can be controlled accurately.

(Continued on next page)

## NEW CHEMICAL FOR R/W . . .

(Continued from page 69)

### How It Works

Whatever the situation where this fenuron weed and brush killer is applied, or the method of application used, certain characteristics of the product's action should be kept in mind.

The active ingredient in these pellets is absorbed through the root system and must be carried into the root zone by moisture. Therefore, symptoms from such treatment usually do not occur in woody plants until several weeks, or longer, after applications have been made, depending on soil type and moisture. The first symptom will be a yellowing around the edge of the leaves, then the plant will defoliate. New leaves may grow out and drop off two or three times before the brush dies. In other words, kill is very slow and a year or more may pass before most species of treated brush die.

### Lateral Movement

The pellets should not be used in areas into which the roots of desirable plants or trees may extend. There is very little lateral movement of fenuron once the pellets have been applied and become fixed in the soil, but kill can occur off the right-of-way if roots from adjacent trees extend into the treated area.

On heavy, tight soils, it may take a higher dosage of this fenuron weed and brush killer than is effective on light, sandy soils.

The pellets disintegrate after 3 to 8 in. of rainfall. Penetration is much faster on porous, well-drained soil surfaces than on heavy soils which flood easily. However, pellets which are protected from direct rainfall action by overhead foliage or trash may take much more rainfall for complete breakdown. Therefore, late winter and early spring, when rainfall is generally more abundant, are the preferred times for application. Applications at other times of the year are eventually satisfactory, but in seasons of drought, as in some areas in 1959, it may take considerably longer to effect the desired brush control.



## HOW CON EDISON CUTS FAULT LOCATING COSTS 50%

(Continued from page 41)

test instruments, since it accomplishes measurements to faults in a matter of minutes compared to hours and without the need of a good conductor or special connections or disconnection of any apparatus. The accuracy is usually within 0.2 of 1% where exact length of feeder is known.

### Daily Use

Preparations for regular daily use is in progress and for the time being the instrument will be utilized on all feeder cable in the category of 4 kv; on low-voltage d-c, control cables, pipe-type cables, open-wire or cable conductors and submarine crossings.

The greater portion of savings will come from eliminating the necessity of intermediate test points to consolidate on locations of invisible faults, since such information will be furnished by this instrument. The remainder of the savings, which is individually high, percentagewise, but numerically less, will come from visible faults found by inspection, and the time and labor saved on open-wire and loop tests. And finally where success is achieved instead of failure, particularly where the old methods of cut-and-try is eliminated, the savings will be greatly appreciated.

### Recent Test

On a recent test shown in the pictures, a truck was sent to Madison Avenue at 107th Street to connect with a junction box (JB) on 240-v d-c feeder. The feeder cable consisted of one control wire, two

pressure wires and two 125-mcm conductors.

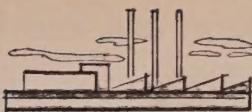
Under the first test with 240-v current the instrument indicated a fault, though not a very obvious one. (The maximum distance of the short-range Telemetroscope is 5000 ft.) The range on the line being tested was totaled and measured at 4480 ft, thus permitting effective use of the instrument. The first test indicated that the fault was probably in the immediate vicinity of the JB, perhaps just a few feet away and possibly between the JB and the JB-manhole four ft from the JB. The operator decided to make a second test using a higher current. With a higher current the operator could produce visible smoke at the point of fault.

### Saved Six Hours

The higher current was applied and the fault was found to be in the JB itself. Thus the use of this new equipment saved as much as six hr of search over the conventional method of sending out a tracing current from the station. The test also revealed a second wire which was open 465 ft out along the line. This would place it between two manholes. Were the second wire fault verified in the conventional capacitance bridge manner, it would have consumed a minimum of six hr, but over-all the use of the new equipment took only about 15 min.

Aside from this new instrument, Con Edison's test truck is also equipped temporarily with a 30-kv high-potential test set and a 4-kv Phanotron for other fault-finding.

# SUPPLY



# FACILITIES

## SALES BRIEFS

### GE Opens Polycarbonate Resin Plant: First In U. S.

The first self-contained facility to be built in the United States specifically for the production of polycarbonate resin, was opened September 14 by General Electric in Mount Vernon, Ind. The culmination of an \$11-million research, development and production program, the plant will produce Lexan® polycarbonate resins for industry.

The new material has excellent electrical properties. It will be used for such components as coil forms, insulators, connectors and coil ce-

ments. The plastic's dimensional stability, heat resistance, and resistance to impact make it ideal for such applications.

GE's new facility, located along the Ohio River, can initially produce in excess of five-million pounds of Lexan resin annually, mostly in pellet form. This capacity can be more than doubled without expanding existing physical facilities, then re-doubled through plant expansion, GE officials pointed out.

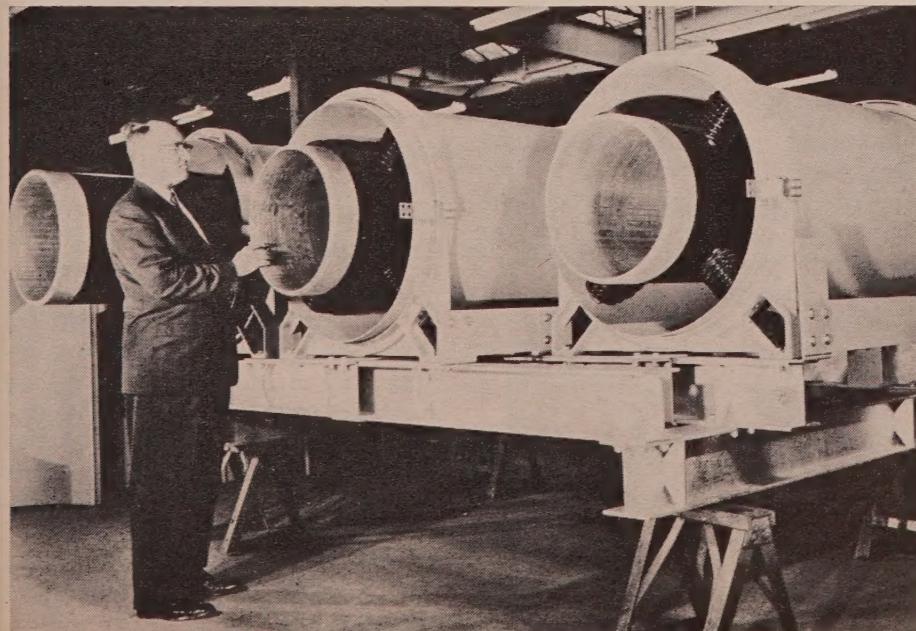
### Epoxylite to Distribute B G & E Cable Accessory Kits

The Epoxylite Corp. of South El Monte, California, has been licensed to distribute recently developed epoxy-orlon cable accessory kits.

The kits, developed by Baltimore Gas & Electric, consist of special packaging of orlon tape and a specialized epoxy-resin formulation.

They are used for making indoor and outdoor potheadless terminations on paper-lead cable in the 5-kv range; for making indoor potheadless terminations in the 15-kv range; and for making hermetic seals on higher-voltage pothead terminations to 35 kv. Kits are also used for making cable sheath and accessory repairs.

Large isolated phase bus is examined by Delta Star Electric Div., H. K. Porter Co. engineer. The 19-in.-diam. aluminum tube conductor of one of the world's largest-sized and largest-capacity electrical buses was produced by Aluminum Co. of America on its 14,000-ton extrusion presses. The assembly is virtually all-aluminum, using formed aluminum sheet for the 42-in.-diam. housing and cast aluminum ring supports. Bus is part of a quantity totaling 2300 ft made recently by Delta Star, ranging in conductor diam. from 19 to 20.5 in., for service ranging from 10,000 to 11,500 amps, 12.6 to 16.5 kv, for three major utility installations.



Multi-Amp Electronics Corp. has recently appointed representatives for up-state New York and the general Chicago, Ill., areas. **E. J. Robinson Associates** will serve New York north of the New York-Pennsylvania boundary and its extension to the Connecticut state line. They will maintain offices in both Buffalo and Syracuse. **Murphy & Dickey** will serve northern Illinois, plus adjacent areas in northwestern Indiana and eastern Iowa from their offices in Chicago.

### CRITICAL PROBLEM SOLVED . .

(Continued from page 49)

by a temperature controller on the steam heating supply line.

The Variable-Orifice desuperheater consists of a vertical section of steel pipe in which a self-regulating orifice is provided by a weighted ball and seat. Steam pressure lifts the ball off its ring seat to a position where it is balanced by steam pressure and flow through the orifice. The ball is held concentric by Inconel spring guides.

Cooling water enters the desuperheater through an annular orifice surrounding the ring seat of the ball, at the point of maximum steam velocity. The passage of steam through its annular restriction between ball and seat produces an aspirating effect on the cooling water. This entrains the water in an area of high turbulence over the full range of flow.

No long run of piping is needed to mix the two fluids. There is no excess water to remove. No atomizing steam is used. There is no spray nozzle. There are no glands or stuffing boxes. Pressured drop remains practically constant for all flows, and is normally 3 to 4 psig.

Flow requirements have been met consistently during the first four months of operation. Discharge steam temperature has been held to 420F, even though the inlet temperature varied between 520F and 550F. Controlled temperature has remained within limits of plus-minus 5F with standard commercial instrumentation.

\*Trademark



"Superforms\* help me  
keep lines in service"  
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"To me, the word 'Superformed' means a number of plus values:

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#### ARMOR RODS . . .

Protect long-span T&D lines at supports

#### LINEGUARDS . . .

Protect short-span T&D lines at supports

#### PATCH RODS . . .

Repair damaged conductors

#### TAP ARMOR . . .

Protects conductor at tapping points

#### FANNGRIPS . . .

For dead-ending strands and conductors

#### FANNSPLICES . . .

Join two ends of conductor wire

#### PLASTIC PRODUCTS . . .

For conductor surface protection

## FANNER

The Fanner Manufacturing Co.  
Brookside Park—Cleveland 9, Ohio  
Division of Textron, Inc.

## Computer to Speed Burns and Roe Calculations



Solutions to problems such as shield thickness for atomic reactor design, nuclear physics problems, power plant heat balances, and distribution and control of electric generation station output will be speeded up by the addition of this IBM 1620 data processing system in the New York offices of Burns and Roe, consulting engineers. Shown above are Dr. S. Baron (seated), Burns and Roe's chief chemical and nuclear engineer, Michael Zizza, Burns and Roe, who will direct day-to-day computer operation, and Richard C. Warren, eastern regional manager of IBM's data processing division.

## Federal Pacific Forms International Company

Formation of Federal Pacific Electric International S. A., an international arm of Federal Pacific Electric Co., has been announced by Frank H. Roby, executive vice president of the company.

FPE International will have headquarters near Zurich, Switzerland, and will be responsible for the manufacturing and marketing of both Federal Pacific products and components produced by Cornell-Dubilier, in all countries of the world except the United States and Canada.

Currently, International manufacturing facilities are already operating in Karlsruhe, West Germany, and Wolverhampton, England. Other locations are under study or have been started.

General manager of the new organization will be Roger D. Wellington.

## Honeywell Sets Up Advanced Systems Division

Minneapolis-Honeywell Regulator Co. has announced the formation of a "Special Systems division," whose primary objective will be the advancement of the state of the art

of complex integrated control systems for industrial and military applications.

The new division will be headquartered in Pottstown, Pa., and will include the management, technical and production personnel of the facility, systems personnel and activities formerly located at the Brown Instruments division at Beltsville, Md.

Functions of the new division will include research, development, design, fabrication, installation, and checkout of specialized control systems and coordination of the design and fabrication of components for these control systems by other divisions of the company.

## Bethea Co. Forms Associate Company

Bethea Co., Inc., has announced the formation of National Electrical Manufacturing Co. The new company will manufacture and sell to manufacturers of electrical equipment high quality castings of aluminum in large volume. Products will include aluminum connectors for transformer and switch manufacturers and other aluminum and iron castings used by producers of electrical equipment.

## PRODUCTION BRIEFS

Federal Pacific Electric Co. has broken ground for a 175,000 sq ft building near O'Hare International Airport northwest of Chicago. When completed in early 1961, the building will house FPE's regional sales office and midwestern redistribution warehouse, Cornell-Dubilier's area sales office and central redistribution warehouse, Economy Fuse manufacturing operations now being carried on in Chicago and Palatine, Illinois, and the Economy Screw Corp., manufacturer of screw products for FPE and other OEM.

The Storage Battery division, Thomas A. Edison Industries, Division of McGraw-Edison Co. has been acquired by the **Electric Storage Battery Co.** Now known as the Nickel Alkaline Battery division of ESB, the organization continues to be headed by Robert A. Weeks, Jr. This addition of the nickel-iron battery line invented by Thomas Edison is one of a series of steps taken in recent years to diversify ESB's business of manufacturing packaged power devices.

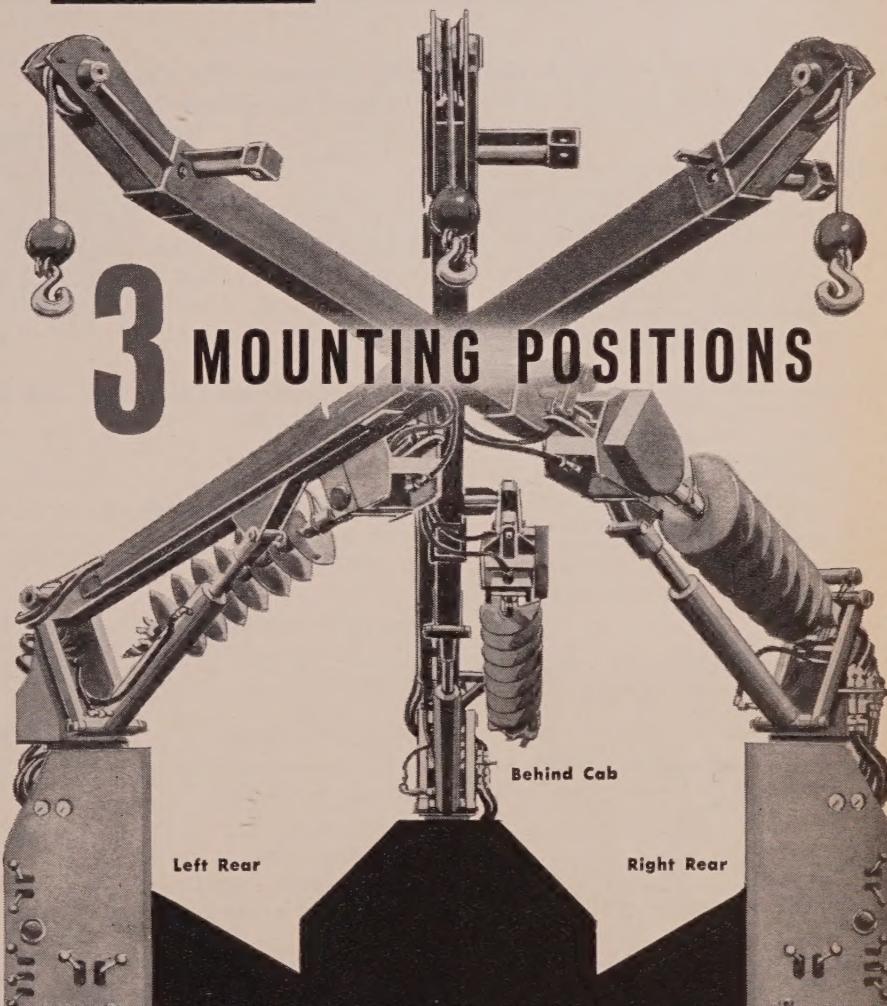
All the outstanding stock of Standard Electric Manufacturing Co., Dallas, Texas, has been purchased by **I-T-E Circuit Breaker Co.** Standard is an assembler of lighting and power switchboards for residential, commercial and industrial applications.

Hitemp Wires, Inc., will be merged into Simplex Wire and Cable Co., according to a plan announced jointly by the directors of the two companies. After the merger, Hitemp will operate as The Hitemp Co., a division of Simplex.

Production of Bituminous Fiber Conduit has begun, according to an announcement by **Triangle Conduit & Cable Co., Inc.** Triangle thus becomes the fourth corporation to undertake production and national distribution of fiber pipe and conduit.



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November 3-4—Pennsylvania Electric Association, Relay Committee, Fall Meeting, Hotel Brunswick, Lancaster, Pa.

November 9-11—American Institute of Electrical Engineers, Second Power Industry Computer Application Conference, Chase Hotel, St. Louis, Mo.

November 14-15—Pacific Coast Electrical Association, Administrative Services Section (Fall Conference), Phoenix, Ariz.

November 14-20—National Electrical Manufacturers Association: Generation, Transmission, and Distribution Equipment Division, Traymore Hotel, Atlantic City, N. J.; Insulating Materials Division, Westchester Country Club, Rye, N. Y.; Lighting Equipment Division, Waldorf-Astoria Hotel, N. Y.; 34th Annual Meeting, Savoy-Hilton Hotel, New York, N. Y.; Wire and Cable Division, Seaview Country Club, Absecon, N. J.

November 15-16—Edison Electric Institute, Area Development Workshop, Park Plaza Hotel, St. Louis, Mo.

November 16-18—Southeastern Electric Exchange, Sales Conference, Henry Grady Hotel, Atlanta, Ga.

November 22—Electric Companies Public Information Program, Inter-Regional Meeting, Detroit Leland Hotel, Detroit, Mich.

November 27-December 2—American Society of Mechanical Engineers, Winter Annual Meeting, Statler Hilton Hotel, New York, N. Y.

November 28-December 2—24th National Exposition of Power and Mechanical Engineering, New York Coliseum, New York, N. Y.

November 30-December 1—Edison Electric Institute, Sales Division, Street and Highway Lighting Committee, Cincinnati, Ohio.

December 1-2—Pacific Coast Electrical Association, Administrative Services Section, Fall Conference, Hotel Safari, Scottsdale, Ariz.

December 5-8—Third National Conference on the Application of Electrical Insulation, Conrad-Hilton Hotel, Chicago, Ill.

January 23-27, 1961—Doble Engineering Conference, Boston, Mass.

January 29-February 3, 1961—American Institute of Electrical Engineers, Winter General Meeting, Statler Hotel, New York, N. Y.

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